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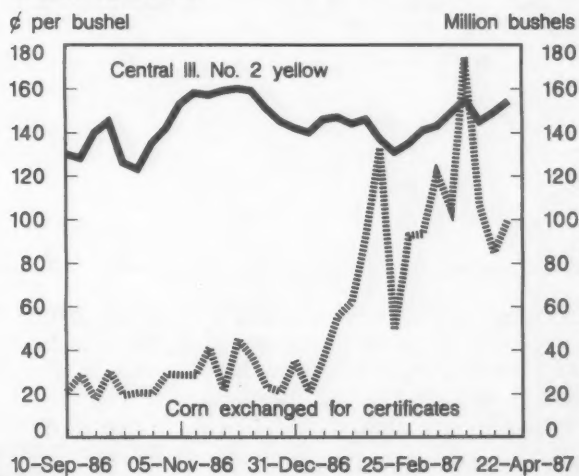
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Research
Service

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May 1987

Feed

Situation and Outlook Report

**Weekly Certificate Exchanges and
Prices for Corn**



CONTENTS

Page	
4	Feed Grain Supply and Use
7	Corn
8	Sorghum
9	Barley and oats
9	Food, Seed, and Industrial Use of Corn
12	Feed Demand
13	World Coarse Grain Situation
	Special Articles:
16	The Short Run Demand For Corn In Finishing Hogs
21	The Effects of Generic Certificates on Domestic Corn Markets
30	Corn-based Ethanol: Situation and Outlook
Back Cover	List of Tables

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SUMMARY

Farmers have enrolled 87.8 percent of the eligible corn base acreage in the Acreage Reduction Program (ARP), compared with 84.7 percent in 1986. The ARP requires producers to idle 20 percent of their base to the eligible for loan and deficiency programs. Some 14.5 million acres of corn base could be idled under the ARP, and nearly 7 million more could be idled under the optional 15-percent Paid Land Diversion Program. Around 29 million acres of base of all feed grains could be idled under the 1987 program, second only to 1983 when 39 million acres were idled.

Growers indicated they intend to plant 106 million acres in feed grains in 1987, down 11 percent from last year because of the ARP and long term Conservation Reserve Program. While corn, sorghum, and barley plantings are expected to decline, oat plantings likely will increase. Oats are commonly planted as a cover crop on conservation-use acreage, especially in years with large acreage idling programs. Also, oat harvested area may increase because low stocks and production in 1986/87 have resulted in tight supplies and relatively higher prices.

Availability and use of generic commodity certificates have affected the corn market dramatically since a year ago. While the effect of certificates may be mitigated by some quick turnaround loan-certificate exchanges, certificates have increased the free supply of corn, lowered its price, and raised its use.

The 1987 corn crop is projected at 7.2 billion bushels, down 13 percent from 1986. Despite the smaller crop, the total supply is expected to be up slightly because the 1986/87 carryout is projected to be a record high at 5.1 billion bushels. However, corn use is expected to exceed production in 1987/88, so that carryout on August 31, 1988, is projected to decline 5 percent to 4.9 billion bushels.

Although cash corn prices have shown some strength in recent weeks, farm prices

generally have bounced between \$1.40 and \$1.50 per bushel since the beginning of the marketing year, averaging about 35 percent below a year earlier. At 35 to 45 cents below the effective loan rate, these prices have made corn attractive for generic certificate redemption.

Feed grain supplies in 1986/87 are 14 percent above a year earlier because of the large harvest and record carryin. Carryout is again projected record large at 157 million tons. Nevertheless, there are some moderately bright spots in the outlook. Both domestic and export disappearance have exceeded expectations, causing carryout projections to be revised downward. In response, feed grain prices have strengthened moderately from earlier this season, although corn, sorghum, and barley prices remain well below previous years. Deficiency and other Government payments are contributing important portions of feed grain producers' incomes.

Looking forward to 1987/88, domestic feed grain production is expected to decline 13 percent, leaving total supply slightly below 1986/87. Carryout in 1987/88 likely will decline as use exceeds production for the first time since the 1983/84 PIK and drought-reduced crop.

World production of coarse grains will decline in 1987/88 because of lower output in the United States, but foreign production is forecast at record levels for the second consecutive year. Initial forecasts place foreign output at 592 million metric tons, up 5 million tons from 1986/87. Foreign area is expected to show little change, while average yields increase slightly to a record. Record foreign yields projected for 1987/88 will continue the steady upward trend of recent years. Despite the current low price environment, there have been only slight adjustments in projected world production patterns.

FEED GRAIN SUPPLY AND USE

Supplies of 1986/87 feed grains are 14 percent above 1985/86 because of the large harvest and record carryin. Carryin stocks were 126 million tons, compared with about 58 million a year earlier. Carryout is again projected record large at 157 million tons.

Despite large supplies and record carryout, there are some moderately bright spots to the outlook. Both domestic and export disappearance have exceeded expectations, causing carryout projections to be revised downward. In response, feed grain prices have strengthened moderately from earlier this season, although they remain greatly below previous years. Deficiency and other Government payments are contributing important portions of feed grain producers' incomes.

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In 1986/87, poor weather is limiting exportable grain supplies, such as corn from Argentina and Thailand. Also, several markets, including China, have shown strong demand. These factors, along with a weaker dollar and low prices, are boosting the U.S. share of world corn and sorghum markets. In the case of barley, U.S. exports are rising dramatically due to an EEP for Saudi Arabia.

Feed Grain Program Enrollment

Producer participation in the 1987 feed grain acreage reduction and diversion program has been record large, as anticipated. In 1987, 87.8 percent of the eligible corn acreage base has been enrolled in the Acreage Reduction Program (ARP), which requires producers to idle 20 percent of their base to be eligible for loan and deficiency programs. Some 14.5 million acres of corn base could be idled under the ARP, and nearly 7 million more could be idled under the optional 15-percent Paid Land Diversion (PLD) program.

A total of around 29 million acres of base of all feed grains could be idled under the 1987 program, representing the largest acreage idling program since the PIK program in 1983, when 39 million acres were idled. Base on participating feed grain farms represents 83 percent of the total in 1987.

Prospective Plantings

Although actual plantings are seldom exactly foretold by growers' intentions, most analysts find little to disagree with in the Prospective Plantings report. On March 1, growers indicated intentions to plant 106 million acres in feed grains in 1987, down 11 percent from last year because of the ARP and long term Conservation Reserve Program (CRP). While corn, sorghum, and barley plantings are expected to decline, oat plantings will likely increase. Oats are commonly planted as a cover crop on conservation use acreage, especially in years with large acreage idling programs. Also, oat harvested area may increase because oats have been in tight supply with stocks and production record low in 1986/87.

Corn plantings are expected to be 67.6 million acres, down 9 million from 1986. The largest decline is expected in the Corn Belt, where plantings may be 4.4 million acres below last year, with Iowa and Illinois leading the decline. Corn plantings in the Lake States and Northern Plains regions are expected to decline 1.8 and 1.3 million acres. Most of the decline can be explained by the increase in acreage idling opportunities of the 1987 feed grains program.

Cropland planted and idled, corn, soybeans, and sorghum

	Corn Belt	Lake States	Northern Plains	Mountain	Delta	South-east	Appala-chian	North-east	Southern Plains	Pacific	Total
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1,000 acres

AREA PLANTED:

Corn											
1985	38,650	14,700	13,610	1,449	460	2,250	5,360	4,529	1,630	810	83,448
1986	35,200	13,100	12,930	1,309	700	1,990	5,065	4,180	1,470	730	76,674
1987	30,800	11,300	11,670	1,162	580	1,610	4,440	4,104	1,270	620	67,556
Sorghum											
1985	1,950	0	7,460	693	2,015	525	720	0	4,880	42	18,285
1986	1,430	0	6,650	645	1,295	346	325	0	4,600	30	15,321
1987	1,140	0	5,650	529	800	235	215	0	3,250	25	11,844
Soybeans											
1985	31,000	6,550	5,680	0	8,700	4,430	5,280	960	530	0	63,130
1986	31,500	6,230	6,195	0	7,950	3,100	5,080	930	495	0	61,480
1987	29,850	6,050	5,960	0	6,800	2,255	4,600	990	380	0	56,885

AREA IDLED:

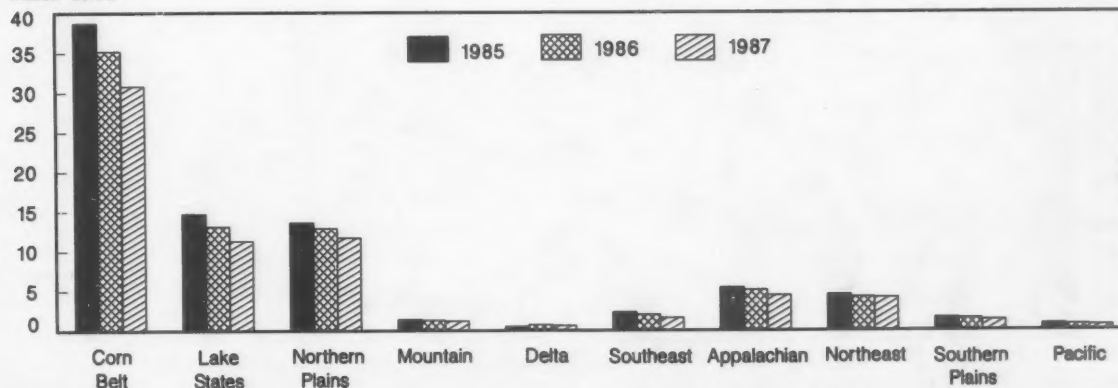
Corn											
1985	3,004	1,022	1,206	80	5	97	212	143	114	12	5,896
1986	6,815	2,343	2,602	183	23	313	660	355	253	55	13,601
1987	10,674	3,683	3,841	294	63	658	1,135	574	454	106	21,482
Sorghum											
1985	98	0	553	67	35	9	16	0	332	1	1,112
1986	244	0	1,294	146	126	41	52	1	833	4	2,739
1987	361	1	1,925	159	269	84	87	1	1,257	6	4,150

AREA PLANTED AND IDLED FOR CORN, SORGHUM, AND SOYBEANS

1985	74,702	22,273	28,510	2,289	11,215	7,311	11,588	5,633	7,486	865	171,871
1986	75,188	21,673	29,670	2,283	10,094	5,791	11,181	5,466	7,651	818	169,815
1987	72,825	21,034	29,046	2,144	8,513	4,843	10,477	5,669	6,611	756	161,917

Regional Corn Plantings

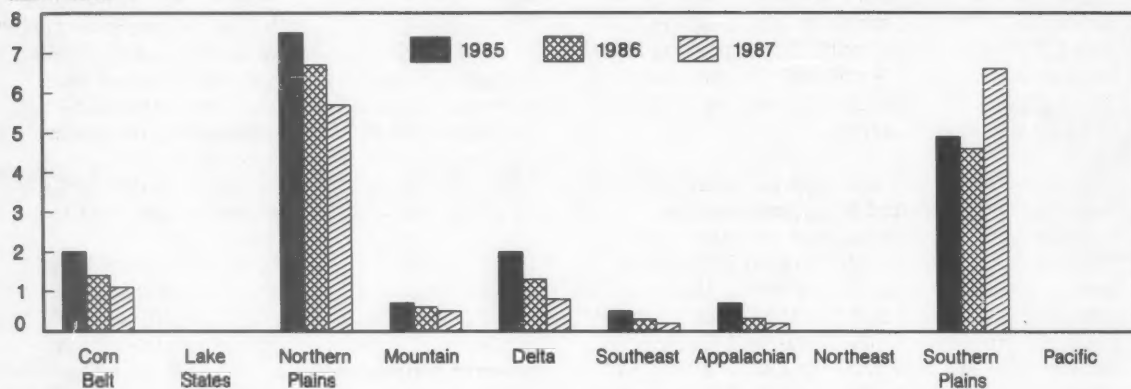
Million acres



1987 preliminary.

Regional Sorghum Plantings

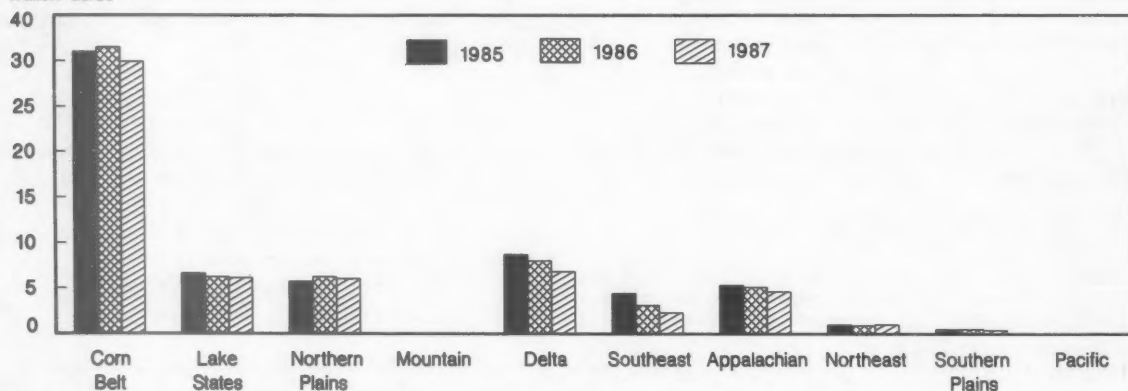
Million acres



1987 preliminary.

Regional Soybean Plantings

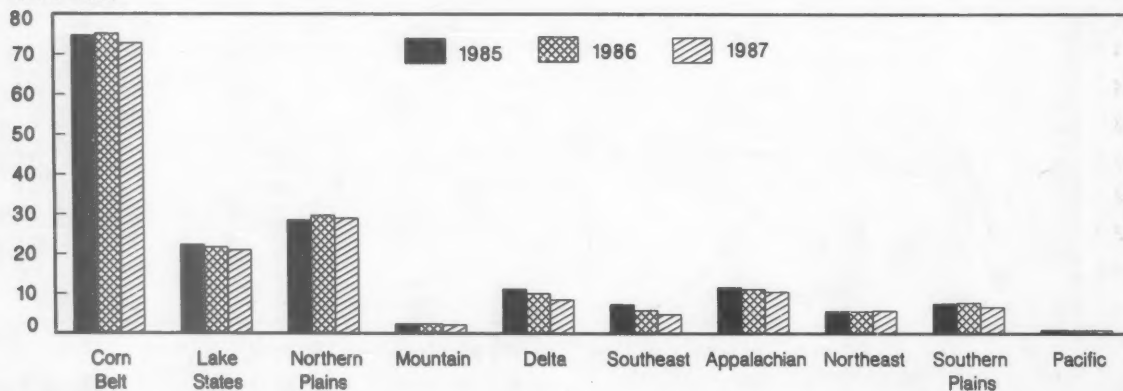
Million acres



1987 preliminary.

Corn, Sorghum, and Soybean Area Planted and Idled

Million acres



1987 preliminary.

Sorghum plantings are expected to decline about 3.5 million acres to 11.8 million. The Northern and Southern Plains States are expected to reduce sorghum plantings by 1.0 and 1.4 million acres, with Texas posting the largest decline at 1.3 million. In addition, the Delta States are expected to reduce sorghum area by 0.5 million acres.

Corn, sorghum, and soybean plantings are frequently substituted in important crop regions. Corn, sorghum, and soybean area planted and idled in 1986 totaled 170 million acres, about 2 million below 1985. Using growers' intentions and the 1987 feed grain program enrollment, the total will likely decline by 8 million acres in 1987. This total does not account for long term CRP acreage, however.

In addition to acreage idled under the annual feed grains program, 17.0 million acres of cropland have entered the CRP, including 2.5 million acres of corn base, 1.3 million acres of sorghum base, and an estimated 2.0 million acres of traditional soybean area. Thus, total planted and idled area, including CRP, for these three crops will likely decline by only about 1.5 million acres in 1987.

Corn

Corn markets have been greatly affected by Government loan activity and generic commodity certificates in 1986/87. Through late April 1987, a record 4.8 billion bushels of

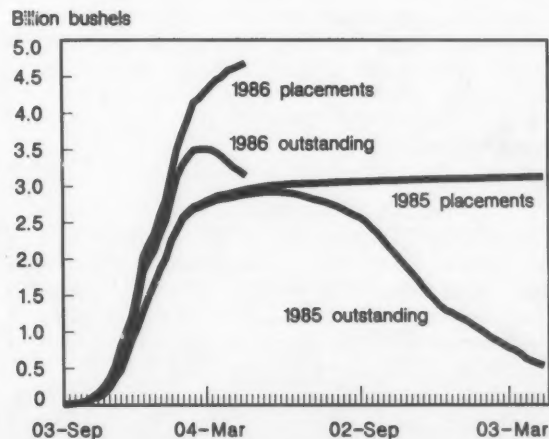
corn had been placed under Government loan, 60 percent above placements of 1985—crop corn by this time last year. From November through February, additions to loan inventories exceeded 200 million bushels in many weeks, although placements tapered off afterward. Greater loan activity has been induced by a combination of factors including low prices and generic commodity certificate availability, as well as a larger proportion of the crop eligible for loan entry this season.

The gap between 1986—crop loans placed and outstanding has been created by the greatly accelerated generic certificate activity. Certificate exchanges have been heavily concentrated in corn, which accounts for nearly 75 percent of all certificate exchanges since the program's inception last year, and has accounted for over 80 percent of exchanges in recent months. Through late April, 1.8 billion bushels of new—crop corn had been redeemed, compared with only 72 million last year.

While the effect of certificates may be mitigated by some quick turn-around loan—certificate exchanges, certificates have increased free supply, lowered prices, and raised use of corn. The special article by Westcott and Hanthorn in this issue of the Feed Situation examines at length the availability, use, and market effects of generic commodity certificates.

Although cash prices have shown some strength in recent weeks, farm prices

Corn: CCC Loan Activity



Corn price support loan activity

Activity	1987 April 29	1986 April 30
	Million bushels	
1985 crop		
Put under loan	3,137.3	2,980.5
Redeemed	604.5	71.8
Acquired by CCC	1,225.0	0.4
Reserve	830.7	—
Outstanding	477.1	2,908.3
1986 crop		
Put under loan	4,751.9	
Redeemed	1,788.8	
Acquired by CCC	1.2	
Outstanding	2,961.9	

generally have bounced between \$1.40 and \$1.50 per bushel since the beginning of the marketing year, averaging about 35 percent below year earlier. At 35 to 45 cents below the effective loan rate, these prices have made corn attractive for generic certificate redemption. The use of certificates has limited normal seasonal price rises to date for 1986/87 (see cover chart). However, free supplies of corn may still be tighter than previously expected.

On March 1, free stocks of corn were 1,256 million bushels. March-August certificate exchanges for corn will likely free from 2 to 2.3 billion bushels, but loan placements could increase by .5 billion during March-August. Thus, if potential supplies from the 60 day FOR rotation period are ignored, March-August availability of corn will not likely be more than 3.0 billion bushels. Total marketing year disappearance is estimated to be 7.18 billion bushels. With disappearance at 4.05 billion from September through February, March-August needs are forecast to be 3.13 billion.

Without supplemental supplies (e.g. from cash redemptions, greater-than-assumed certificate exchanges, or extended FOR rotation), free supplies could tighten. The 60 day FOR rotation period could give market access to a substantial portion of the 1.4 billion bushel FOR. On the other hand, feed and residual use could be underestimated if

March-August keeps pace with the high rate of disappearance established in the first half of the marketing year.

For these reasons, and because export prospects have improved in recent months, cash prices of corn have recently strengthened. In contrast to most years, when foreign sales slack off at this time of year, corn prospects are improving. Important buyers—the USSR, Japan, and Korea—have shown strong demand for U.S. corn as lower Argentine coarse grain yields limit exportable supplies and sales from China dwindle. Cash bids for number 2 yellow corn in Central Illinois ranged from \$1.60 to \$1.90 per bushel from late April through early May, after staying between \$1.20 and \$1.60 for most of the marketing year.

Unless a fairly severe drought develops, upside potential to corn prices is limited, however. As cash prices advance above the \$1.84 effective loan rate plus interest charges, the 3 billion bushels of 1986-crop corn outstanding under Government loan will become available to the market through cash redemptions.

Sorghum

Participation by sorghum growers in the 1987 feed grains program is a record 83 percent. Participating sorghum producers will idle 4.1 million acres in the ARP and PLD programs this year. The March Prospective Plantings report indicated that growers intend to plant 11.8 million acres to sorghum in 1987, down 23 percent from last year, and the smallest area seeded since 1949. With lower area and trend yields, production is projected to be almost 680 million bushels. Even with the large carryin, 1987/88 supplies may be down from 1986/87 because of the expected smaller crop.

With disappearance projected unchanged from 1986/87, carryout in 1987/88 should decline by 10 percent to 662 million bushels. Although below this year's expected carryout, ending stocks in 1987/88 would still be large at 88 percent of use. The farm price has been between \$1.30 and \$1.40 per bushel this marketing year, about 30 percent below a year earlier.

Corn needs and availabilities, March-August, 1987

	Availabilities
	Million bushels
a. March 1 stocks	8,246.8
b. CCC owned	1,362.2
c. FOR	1,339.8
d. Under loan	4,289.0
e. March 1 free stocks (a-b-c-d)	1,255.8
f. March-Aug. loan placements	500.0
g. March-Aug. loan redemptions 1/	2,300.0
h. March-Aug. availabilities (e-f+g)	3,055.8
i. March-Aug. disappearance	3,133.4
j. September 1 free stocks (h-i) 2/	-77.6

1/ Assumed exchanged for certificates only.

2/ Cash loan redemptions and FOR rotation are not accounted for, but would make grain available to the market; cash redemptions would presumably be large enough to result in positive free stocks.

Sorghum exports are forecast at 225 million bushels in 1986/87, up 26 percent from 1985/86. Although sales and shipments to date are only up 6 percent over last year, expected purchases by Venezuela and Mexico could make the 225-million-bushel forecast. However, sorghum exports may suffer from competition from corn: sorghum Gulf Port prices have exceeded the corn price in several months this marketing year. In addition, free stocks of sorghum are tight with a relatively slow pace of redemption to date, and unless cash prices increase, loan stocks may not be accessible.

Barley and Oats

Supplies of barley and oats have been tight relative to the situation for other feed grains. Relatively high prices, relaxation of limited cross-compliance, and cover crop seedings have led to an increase in prospective oat plantings. At 44 percent, oat producers' participation in the feed grain program is well below other grains, but well above previous years.

Oat production could increase about 25 percent above last year, leading to a slight increase in supply. Imports are expected to remain a fairly important source of supply at 30 million bushels. If availability improves, use may increase slightly, although exports are expected to continue to be nil.

Although farm prices for oats were below \$1 per bushel last summer, they have rebounded to nearly 30 percent above last year, and have stayed roughly on a par with corn instead of the more normal 50 to 55 percent of the farm price of corn. In Minneapolis, the price per ton of oats was almost double that of corn during October-February (\$108 compared with \$54). Because of the high prices, oats in the FOR were released for redemption on May 8, although this is expected to have negligible market effect.

Although recent barley crops have been near record large, use has almost kept pace with production. Carryout grew about 30 percent per year from 1983 through 1985 and has remained fairly constant since then. Barley exports have rebounded from last year to a projected record 150 million bushels for 1986/87 because of EEP sales to Saudi Arabia.

The farm price of barley has ranged between \$1.45 and \$1.70 per bushel since the start of the marketing year, mostly staying 15 to 20 percent below a year earlier. However, like oat prices, barley prices have been unusually high relative to corn at a 10- to 15-percent premium instead of the more traditional 15- to 20-percent discount.

FOOD, SEED, AND INDUSTRIAL USE OF CORN

Food, seed, and industrial use (FSI) of corn for the 1987/87 crop year is projected to grow 2 percent above the previous year. The growth in FSI use will probably continue at this rate for the next several years which would be well below the double-digit increases of the early 1980's. In the previous 5 years, sweeteners and starch dominated the FSI scene, but ethanol now is taking a more important role.

Corn sweeteners continued their strong impact on the U.S. sweetener markets. Per capita use of corn sweeteners surpassed sugar (sucrose) in calendar year 1985 by 3.2 pounds. In 1986, per capita corn sweetener use increased to 6.3 pounds over sucrose and in 1987 the gap is projected to expand to 8.3 pounds.

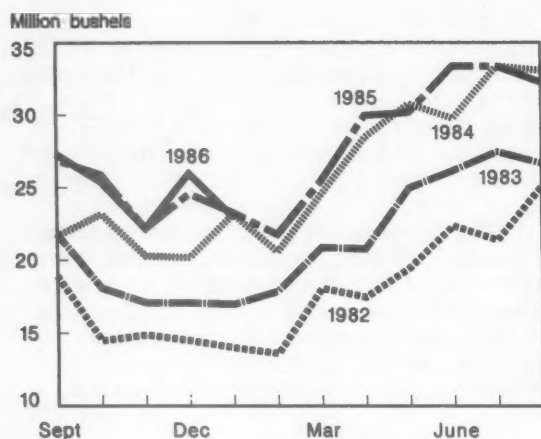
Non-caloric sweetener use increased in 1986 to 18.5 pounds per capita, up 3 percent from 1985. While consumption of aspartame has increased 13 fold since 1982, the overall use of non-caloric sweeteners has only doubled. Much of aspartame's gains at this time have come at the expense of saccharin and not from corn sweeteners. Since 1984, U.S. saccharin use has dropped nearly 50 percent.

A new non-caloric sweetener that might have an impact on caloric sweeteners could be approved for use in the near future. The Johnson and Johnson Company has applied for FDA approval to market a new sweetener called sucralose. Sucralose is 600 times sweeter than sucrose and has heat stability similar to sucrose. This means that sucralose could have commercial value in baked and cooked products, unlike aspartame which decomposes with heat. If sucralose receives approval, is economically viable, and receives

consumer acceptance, it could provide new areas of competition for corn sweeteners.

Production of high fructose corn syrup (HFCS) is projected to require 335 million bushels of corn in 1986/87. This would represent less than a 2-percent increase from the 1985/86 crop year. As maturity comes to the HFCS market, production increases should remain at about 2 to 3 percent per year. This past fall and winter, producers were able to keep up with HFCS demand and shipments were sent out on a relatively smooth schedule.

Corn Use in HFCS Production



Corn: Food, seed, and industrial use 1/

As HFCS production continues to grow, the capacity of the industry will eventually be strained and expansion will be required to keep up with demand. The capacity of the industry is strained, particularly during the summer months, when soft drink demand is at its peak. However, the fact that HFCS prices dropped to historical lows this past winter indicates that the industry can more than adequately handle consumer demand for the present time. HFCS producers had a fairly successful year despite low HFCS prices. This is because of the low price the industry paid for corn and the relatively high prices they received for their byproducts, corn gluten feed and meal.

The Minneapolis Grain Exchange (MGE) began trading HFCS futures contracts in early April. Volume was relatively low in the first several weeks of trading but this is not unique for any new commodity contract. The long term prospects for the futures contract appear to be good as both HFCS producers and soft-drink manufacturers remain interested in using the futures contract as an additional measure of price protection.

Glucose and dextrose production has remained fairly constant this past fall and winter. Yet, there were times when tight supplies forced producers to scramble to keep their shipments on schedule. These tight

Year beginning September 1	Wet-milled products				Dry-milled alcohol	Dry-milled and alkaline cooked products	Seed	Total
	HFCS	Glucose and dextrose	Starch	Alcohol				
Million bushels								
1975	45	162	115	5	20	154	20	521
1976	62	164	116	10	15	155	20	542
1977	80	170	124	10	20	158	20	581
1978	105	170	124	15	20	155	20	608
1979	127	170	120	25	20	158	20	640
1980	165	183	120	35	35	160	20	718
1981	185	183	130	83	35	162	19	797
1982	215	188	127	130	50	170	15	895
1983	256	191	145	150	50	164	19	975
1984	310	188	142	170	100	160	21	1,091
1985	330	190	150	185	125	161	19	1,160
1986 2/	335	190	155	190	135	161	17	1,182

1/ Data in this table are estimates based on production and sales figures obtained from various Government and private industry publications as well as on unpublished information provided by numerous industry sources. 2/ Projected.

supplies stabilized prices to a better degree than what occurred in the HFCS market.

Production of crystalline fructose is still slated to begin in mid-1987, with construction of a new crystalline fructose plant expected to be finished in the near future. The plant features a new production process but it is unclear if this process provides a superior crystalline fructose product or if it extracts a higher yield per bushel of corn. Based on plant capacity, crystalline fructose will not require more than 5 million bushels of corn annually.

Crystalline fructose appears to be at the same point in time that HFCS was in the late 1960's. Food processors were not really sure of HFCS's commercial value until sufficient laboratory time was spent in testing and evaluation. Similarly, not until crystalline fructose becomes available in commercial quantities and food processors run sufficient laboratory tests will there be an adequate evaluation of its usefulness. This evaluation ultimately will determine the success of crystalline fructose and its long term demand for corn.

The dry-milling of corn flour, meal, and cereal is also a relatively mature market that contains few year-to-year surprises. The three products continue to show modest gains but these gains are typically balanced out by the lower use of corn in the beer brewing process. Corn use appears to be losing ground in beer production because the popular light beers require reduced amounts of corn, and because of competition from rice-based beer.

It is difficult to accumulate sufficient data to provide an accurate estimate of ethanol production. Production data for ethanol needs to be acquired on a company-by-company basis, but most companies view their production numbers as proprietary and are unwilling to share that information.

Estimates of corn use for ethanol could be based on the reported monthly ethanol-blend fuel sales. The Department of Transportation gathered ethanol-blend sales figures on an individual State basis. In turn, the amount of corn required to produce that quantity of ethanol could be calculated. This means that USDA estimates will not necessarily match up

Corn use in alcohol production

Marketing year	Wet-milled		Dry-milled		Total
	Fuel	Beverage 1/	Fuel	Beverage	
Million bushels					
1975	0	5	0	20	25
1976	0	10	0	15	25
1977	0	10	0	20	30
1978	0	15	0	20	35
1979	10	20	0	20	50
1980	20	20	15	20	75
1981	55	30	25	10	120
1982	100	30	40	10	180
1983	120	30	40	10	200
1984	140	30	90	10	270
1985	155	30	115	10	310
1986 2/	160	30	125	10	325

1/ Also includes nonfuel industrial alcohol.
2/ Projected.

with production numbers on a month-to-month basis because of potential changes in inventory levels. However, in the long term, quarterly and annual numbers will provide a reasonable estimate of ethanol production. Based on this procedure, revisions have been made in USDA estimates of corn use in ethanol for the current and the previous two crop years.

Corn use for ethanol can be calculated through the following procedure. The monthly gasoline and ethanol-blend sales figure is divided by 10 (the blend is 10 percent ethanol and 90 percent gasoline) to determine the ethanol portion. Then, adjustments are made to eliminate imported ethanol and also the U.S. ethanol produced from products and feedstocks other than corn (in 1986, 87 percent of U.S. ethanol was produced from corn). After the ethanol from U.S. corn is calculated, a conversion must be made to bushels of corn. Processors estimate that 2.5 to 2.6 gallons of ethanol can be produced per bushel of corn.

Corn Gluten Feed and Meal Estimates

The production figures for the past 10 years for corn gluten feed and meal have been tabulated, along with the exports and domestic disappearance numbers. Corn gluten feed and meal are byproducts of the wet-milling industry. Accordingly, gluten feed and meal production has increased sharply since the early 1980's, primarily from meeting demand

Corn gluten feed and meal; production and use,
1975 to date 1/

Year beginning Sept. 1	Production			Exports	Domestic use
	Feed	Meal	Total		
1,000 short tons					
1975	2,136	452	2,587	1,104	1,483
1976	2,298	486	2,784	1,417	1,367
1977	2,495	528	3,023	1,913	1,110
1978	2,729	577	3,307	2,064	1,243
1979	3,036	642	3,678	2,529	1,149
1980	3,288	696	3,983	3,110	873
1981	3,755	794	4,550	3,083	1,467
1982	4,304	910	5,214	3,783	1,431
1983	4,795	1,014	5,809	4,040	1,770
1984	5,260	1,113	6,372	3,642	2,730
1985	5,506	1,165	6,670	4,585	2,085
1986 2/	5,644	1,194	6,838	5,250	1,588

1/ ERS estimates, except exports from the Bureau of the Census.

2/ Projected.

for high fructose corn syrup (HFCS) and, to a lesser degree, ethanol.

Corn wet-millers remove the starch from the corn kernel to produce modified and unmodified starch, glucose, dextrose, fuel and beverage alcohol, and HFCS. The germ is also separated from the kernel to produce corn oil. The gluten portion of the kernel, the hulls, and the germ after the oil has been extracted, make up the majority of gluten feed and meal.

Yields of gluten feed from a bushel of corn vary depending on the product and its processor, but typically range from 12 to 14.5 pounds per bushel of corn. Gluten feed contains approximately 20 percent protein and is mostly used by livestock producers. The majority of gluten feed produced in the U.S. is exported.

There is less variability in gluten meal yield and typically 2.75 pounds are produced from each bushel. Gluten meal has about 60 percent protein and the majority is consumed domestically. Most gluten meal is used by poultry producers.

FEED DEMAND

Feed disappearance for the four feed grains in the 1986/87 marketing year is projected to be 141 million tons, up 6 million

from 1985/86. In the first half of the current marketing year, corn feed disappearance jumped 14 percent, leading to a 10-million-ton increase in projected corn feed use for the year. However, decreased feeding of wheat and other feedgrains will offset much of the increase in feed use of corn.

As the 1987 crops of small grains and early sorghum are harvested, feed use of corn could begin to slacken. However, most small grains have been priced well above feeding value in relation to corn. Wheat feeding is expected to be less than 5 million tons this summer as wheat prices remain near the loan rate, well above the price at which wheat will substitute for corn in most rations.

Grain consuming animal units (GCAU's) for poultry and hogs in 1986/87 have recently been revised upward, offsetting projected declines in beef and dairy animal units, leaving total GCAU's almost level with last year.

The largest animal unit decline is the 6-percent drop in dairy units due to the Dairy Termination Program. Some of this decline will be offset by increased feeding rates as dairy producers' profits remain strong at current feed and milk prices. Also, cattle on feed on January 1 were down 5 percent from a

Grain consuming animals units and High
protein animal units, 1983/84-86/87

Livestock group	1983/84	1984/85	1985/86	1986/87
Million units				
GCAU's				
Dairy	12.4	12.2	12.6	11.8
Fed beef	17.8	19.1	17.6	16.8
Other beef	4.7	4.5	4.3	4.2
Hogs	20.4	19.8	19.3	19.4
Poultry	20.7	21.0	21.7	22.9
Other	1.9	1.9	1.9	2.0
Total	77.9	78.4	77.3	76.9
HPU's				
Dairy	12.7	12.4	12.8	12.0
Fed beef	10.3	11.1	10.2	9.7
Other beef	8.1	7.7	7.4	7.2
Hogs	25.9	25.2	24.5	24.6
Poultry	51.1	52.0	54.4	58.0
Other	0.9	1.0	1.0	1.0
Total	109.0	109.4	110.1	112.6

year ago. However, fed cattle marketings are expected to decline by less than 1 percent as feedlots are expected to stay current and increase their turnover. Thus, feed use by dairy and beef cattle will likely be larger than the animal units would suggest.

Poultry animal units are expected to increase 5 percent as broiler and turkey production may soar to 8 and 16 percent, respectively, above year-earlier levels.

Hog industry expansion is under way with the record high hog-corn price ratios of recent months, and is likely to continue to boost feed demand in the 1987/88 marketing year. Also, because increases in broilers, turkeys, and hogs weigh in relatively strong, high-protein animal units are expected to expand over 2 percent in 1986/87, and continue to increase into 1987/88. Thus, even more than demand for energy feeds, domestic demand for soybean meal and other high protein feeds is expected to be strong for a couple of years.

WORLD COARSE GRAIN SITUATION

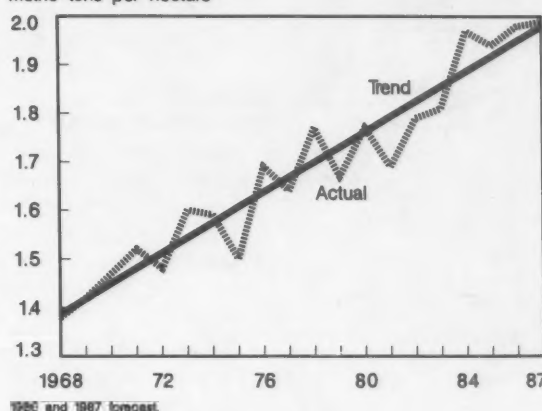
Record Foreign Coarse Grain Production Forecast for 1987/88

World production of coarse grains will decline in 1987/88 because of lower output in the United States, but foreign production is forecast to reach record levels for the second consecutive year. Initial forecasts place foreign output at 592 million tons, up 5 million from 1986/87. Foreign area is expected to show little change from a year earlier while average yields increase slightly to a record. Record foreign yields projected for 1987/88 continue the steady upward trend of recent years. (see chart) Despite current low prices, only slight adjustments in world production patterns are occurring.

The production outlook for 1987/88 contains considerable uncertainty, particularly for countries in the Southern Hemisphere where planting will not start for a few months. To the extent that farmers can substitute other crops for coarse grains, relative prices will figure prominently in decision-making. Growers in Canada, for example, face sharply reduced prices for all their crops this year. Some may reduce barley

Average Foreign Coarse Grain Yields

Metric tons per hectare



plantings in favor of wheat or rapeseed, or choose to increase fallow. Weather is a critical element in coarse grain production for the USSR, but 1987/88 is projected to be about the same as 1986/87.

Trade Outlook Improves for 1987/88

World coarse grain trade is projected to increase 3 percent in 1987/88 to 90 million metric tons, with continued low prices generating a modest increase in import demand. The stocks-to-use ratio for the world is very high, but the United States holds the largest portion, nearly three-quarters. U.S. exports are forecast up 5 percent to 49.8 million tons (October-September). This represents a 55 percent market share, continuing the export recovery that started this year. Market shares among exporters will be partly influenced by the availability of credit and EEP, especially for barley.

During 1986/87, the United States is expected to increase its share of the world coarse grain market to a forecast 54 percent from just 44 percent the previous year. U.S. exports are forecast to reach 47.2 million metric tons, up nearly 11 million tons or 30 percent.

In 1986/87, poor weather is limiting the availability of exportable grain supplies, such as corn from Argentina and Thailand. Also, several markets, including China, have shown strong demand. These factors, along with a weaker dollar and lower prices, are boosting

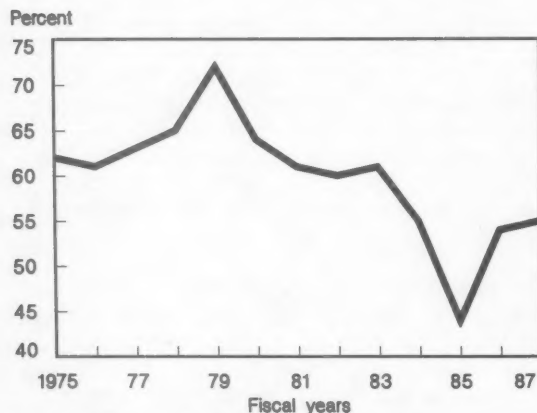
the U.S. share of the world corn and sorghum markets. In the case of barley, U.S. exports are rising dramatically due to an EEP for Saudi Arabia.

Table 1.—World coarse grain trade: Major exporters and importers, 1984/85–1987/88

Country	1984/85*	1985/86	1986/87 forecast	1987/88 forecast
Million metric tons				
EXPORTERS				
United States	55.4	36.4	47.2	49.8
Argentina	10.6	9.7	6.5	8.0
Canada	3.3	5.8	7.3	5.1
EC-12	8.5	8.1	7.0	9.0
Australia	6.4	5.0	3.7	4.0
South Africa	0.2	1.5	2.0	1.5
Thailand	3.5	4.0	3.1	2.9
China	6.0	7.1	4.3	4.0
World total	100.7	83.3	87.4	90.0
IMPORTERS				
Japan	20.7	21.5	21.5	21.7
USSR	27.3	13.5	14.0	14.0
West Europe	10.9	6.4	4.9	5.2
Eastern Europe	3.3	5.9	4.6	3.7
Korea, Rep.	3.4	3.9	4.4	5.8
Taiwan	4.3	4.1	4.6	4.6
Mexico	4.2	2.4	4.1	5.1
Saudi Arabia	5.5	7.4	7.9	8.5
China	0.1	0.7	2.6	3.0
World Total	100.7	83.3	87.4	90.0

*October–September year.

U.S. Share of World Coarse Grain Exports



Excludes intra-EC trade. 1986 and 1987 forecast.

A small increase in exportable supplies of corn for the major foreign competitors is anticipated in 1987/88, assuming normal weather. Argentina's production and exportable surplus are forecast to jump about 2 million tons, accounting for nearly all the increase. Although the overall area planted to corn by other competitors—France, South Africa, and Thailand—will drop slightly, yields are expected to improve.

Another important influence on world corn supplies will be China, whose imports rose unexpectedly last year while it reduced its exports. China is likely to reduce exports again this year to 3.5 million tons, compared with 6.4 million 2 years ago. Although China is attempting to reverse the movement by some farmers out of grains and into other crops, and 1987/88 production is projected to increase, domestic demand is growing very rapidly.

Competitor supplies of sorghum should increase marginally because of better crops in Australia and Argentina, the two leading competitors. Little change from last year is expected for the smaller exporters, Thailand and Sudan.

Abundant world supplies of barley will continue this year, as another record crop is forecast. Trade will likely equal or surpass the record levels of the last 2 years as feed use continues to rise. Much of the increase in import demand has come from Saudi Arabia, whose imports reached 7 million tons in 1986/87. Although production in Canada is expected to fall below last year's record, rebounding production in the EC will offset this. Only minor gains are projected for Australia's crop due to the pressure of low prices.

Many Factors To Influence World Demand Growth

World demand for coarse grain imports will rise again in 1987/88, but the 3 percent increase is relatively modest given low world prices. Continued high world production, especially output in many importing countries, is a major factor holding back import demand. Self-sufficiency is a widespread policy goal and many countries have adopted policies that insulate their farmers from world market prices that would currently signal cutbacks in

production. The EC's Common Agricultural Policy is the most prominent example of the latter. For all these reasons, imports as a share of world coarse grain use have declined to less than 11 percent in 1986/87 compared with 13 percent 2 years ago.

Income growth, an important determinant of feed grain demand, is expected to increase at a slightly higher rate in the developed countries during 1987 and 1988. For the centrally planned countries, the rate of growth is forecast to slow marginally from 1986, but remain good. However, foreign exchange shortages and debt problems will persist in some of these countries, constraining imports. Sluggish growth is forecast in the developing countries for 1987, but a significant pick-up is likely during 1988, especially for oil-exporting countries.

Developing countries as a group represent the greatest potential for increases in livestock demand in the long-term. In the near term, this potential is only likely to be realized in areas of robust growth, such as East Asia, whose income growth is projected to grow faster than any other region in both 1987 and 1988. U.S. feed grain exports to Korea and Taiwan have increased strongly during 1986/87, and should remain high in 1987/88.

Competition between coarse grains and other feedstuffs could moderate slightly in 1987/88 but importers will remain sensitive to prices in their feed use decisions. While non-grain feeds such as cassava, citrus pellets,

and protein meals will remain abundant, the availability of feed wheat could decrease slightly. Although total foreign use of coarse grains will rise 3 percent in 1986/87, estimated feed use of coarse grain except barley will drop slightly. Poor weather has led to the downgrading of much milling quality wheat in 1986/87, and both Australia and Canada have unusually large amounts of feed wheat to export. The EC also has plentiful export supplies and domestic supplies are abundant in many countries. During 1986/87, foreign feeding of wheat will increase nearly 12 percent to an estimated 93 million metric tons. In the USSR, an estimated 40 percent of total wheat use will be for feeding in 1986/87. Notable increases in importers' feed wheat use were registered in Korea, up 50 percent, Spain, up 52 percent, and Mexico, up 28 percent.

Weather Could Swing Outlook

The current outlook for 1987/88 is for modest recovery in world coarse grain trade as the United States continues to recapture some of its traditional market share. Foreign competitors are showing limited response to lower world prices in the short term and total foreign production will stay high. However, extremes of weather leading to crop disasters or bumper crops in major producing countries could change the outlook substantially. However, there is generally enough variation in world weather to offset fluctuations in either direction. Unanticipated policy shifts in critical countries present another possibility that could affect forecasts.

THE SHORT RUN DEMAND FOR CORN IN FINISHING HOGS

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Abstract: The short-run demand for corn in finishing hogs can be approximated from a feed input-output relationship, if that relationship represents an average of actual hog production. The demand relationship enables inferences to be made about short run adjustments in the quantity of corn used, average weight of hogs, and hog production in the short-run. For the 1985/86 feeding year, the price elasticity of feed demand for corn is estimated to have been $-.34$ at the average prices for hogs and corn. The demand becomes less inelastic with an increase in the price of corn or a decrease in the price of hogs, and more inelastic with a decrease in the price of corn or an increase in the price of hogs.

Key words: Feed conversion, price of feeds, price of hogs, demand for corn, elasticity of demand.

Domestic feeding of livestock and poultry is the major use of corn, accounting for about 60 percent of total disappearance in recent years. Because corn is important in crop and export revenues, and in providing most of the energy feed for the domestic livestock and poultry industries, the factors that affect demand for corn are of great interest to grain analysts, livestock analysts, and policy makers.

Many econometric studies have been undertaken to measure the price responsiveness of feed demand for corn. In these studies, price elasticity of demand for corn was generally determined to be between $-.4$ and $-.7$ for annual models. Shorter term models have elasticities closer to zero.

The problem with most econometric studies is that feed use is measured by feed and residual disappearance. Feed and residual is an indirect, and possibly poor measure of feed use because it generally includes waste and shrinkage and may include measurement errors.

An alternative way to estimate the feed demand elasticity is to derive the profit-maximizing response to changes in the price of a feed ingredient, using data that measure feed consumption and livestock weights over the relevant finishing period for a species of livestock.

If a market stimulus to increased hog production occurs, the number of hogs available for market finishing will remain fixed for a period of 7-8 months. This includes 2-3 months necessary to raise more gilts to breeding age, 3.7 months of gestation, and approximately 1.5 months of lactation. Where the stimulus is to decrease production, the period of fixed availability will be reduced to about 5 months because gilts held for breeding likely will be sold as market hogs although most hogs already bred generally will be farrowed.

During this period of fixed numbers available for finishing, hog production and corn use will depend on the weight of slaughter hogs, which will in turn be determined by feed prices and the price of slaughter hogs. Knowledge of an input-output relationship for the hog fattening process, characteristic of the average feeder, will allow the development of a short-run demand for corn.

Analytical Procedure

Assuming that hog feeders will try to maximize profits or minimize losses in the short run, they will seek that output where the additional feed cost is just offset by the additional value added for the increment of gain (marginal cost = marginal revenue). This

point occurs where the ratio of the cost of feed per pound to the price of hogs per pound is equal to the slope of the input-output relationship. The slope of the input-output relationship is given by the first derivative, with respect to quantity of feed fed.

Thus, the short run demand for corn in finishing hogs can be measured by completing the following steps:

1. Fit an appropriate equation to the input-output data and take the first derivative.
2. Using a representative formula for hog finishing, iterate the price of corn through a range of prices, holding other ingredient prices fixed, to determine the cost per pound of feed at each price of corn.
3. Divide the series of feed costs by the net price per pound to producers for slaughter barrows and gilts.
4. Solve the first derivative of the input-output function for each ratio in step 3 to determine the quantity of feed that would equate marginal cost to marginal revenue.
5. Multiply the proportion of corn in the feed ration by the quantity of feed determined in step 4 to yield the short-run demand for corn.
6. The relationship between quantity fed and price can be expressed as an equation by fitting a line through the schedule of prices and quantities.

The input-output data are from swine research at the University of Nebraska. ^{1/}

^{1/} Deshazer, J.A., and N.C. Teter, "Evaluation of Swine Housing Through Simulation," Proceedings of the International Livestock Environment Symposium, American Society of Agricultural Engineers, St. Joseph, Mo., ST0174, 1974, pp. 103-108, and Teter, N.C., J.A. Deshazer, and T.L. Thompson, "Operational Characteristics of Meat Animals, Part I: Swine," Transitions of the American Society of Agricultural Engineers, Vol 16. (1973), pp. 157-159.

This research estimated the daily cumulative feed fed and weight per hog in feeding 45-pound feeder pigs to a final weight of 248 pounds, based on performance data for energy supplied and heat loss. For this study the data points were taken at intervals of approximately 50 pounds of feed fed (table 1.). The results of these data agree closely with the study by Van Arsdall and Nelson. ^{2/}

In the Van Arsdall and Nelson study, the feeder-finishing enterprise in the North Central Region started with a 47-pound feeder pig and ended with an average slaughter weight of 229 pounds. For the 182 pounds of gain added, feed used totaled 677 pounds, or 3.72 pounds per pound of gain. According to the Nebraska data, pigs started at 45 pounds would require a total of 694 pounds of feed to reach an average weight of 229 pounds. Thus, a gain of 184 pounds would be achieved with a

^{2/} Van Arsdall, Roy N., and Kenneth E. Nelson, *U.S. Hog Industry*, Agricultural Economic Report No. 511, NED, ERS, USDA, 1984, p. 26.

Table 1.—Nebraska hog feeding data ^{1/}

Days on feed	Average weight per hog	Total feed fed
Pounds		
0	45.00	0
14	64.58	50.68
25	83.25	100.56
34	99.39	147.97
43	115.71	200.78
51	130.75	251.56
58	144.16	298.71
65	156.59	348.48
72	168.64	400.34
78	178.98	446.26
85	191.02	501.43
91	201.25	550.02
97	211.10	599.79
103	220.88	650.58
109	230.59	702.34
115	240.21	755.02
120	248.15	799.58

^{1/} Deshazer, J.A., and N.C. Teter, "Evaluation of Swine Housing Through Simulation," Proceedings of the International Livestock Environment Symposium, American Society of Agricultural Engineers, St. Joseph, Mo., ST0174, 1974, pp. 103-108, and Teter, N.C., J.A. Deshazer, and T.L. Thompson, "Operational Characteristics of Meat Animals, Part I: Swine," Transitions of the American Society of Agricultural Engineers, Vol 16. (1973), pp. 157-159.

feed use rate of 3.77 pounds per pound of gain. However, the Nebraska data would require 108 days for this gain, compared with 124 days for the North Central hog producers.

The assumed ration is 85.6 percent corn and 14.4 percent hog feed concentrate mix. The concentrate contains 38 percent protein, 2,707 thousand calories per kilogram (kcal/Kg) of metabolizable energy (ME), minerals, and vitamins. The complete ration contains 3,240 kcal/kg of ME and 13 percent protein, meeting the National Research Council's recommendations for finishing swine over 130 pounds. ^{3/}

Corn prices are considered as prices received by farmers and are iterated by 20-cent intervals from \$3.00 a bushel to \$1.20. The purchased feed concentrate is the price paid by farmers for 38-42 percent hog concentrate in the Corn Belt Region from the January 1987 Agricultural Prices. ^{4/} This price is held constant at \$13.30 cwt or \$1.92 per cwt of the complete hog ration. Grinding and mixing costs were assumed to add 91 cents per cwt to feed costs.

Hog prices are considered as net prices received by farmers and were set at \$45 per cwt for the base demand, \$50 per cwt for an increase in demand, and \$40 per cwt for a decrease in demand. It was not necessary to make hog prices a function of slaughter weight for the relevant weight range of the input-output function. This past March, for Iowa and Southern Minnesota direct sales, US 2-3 grade slaughter barrows and gilts averaged \$47.69 cwt for both 210-240 and 240-250 pound weights; \$46.40 for 250-270 pound, and \$44.89 for 270-300 pound hogs. At South St. Paul, the only market to report prices for lighter weight hogs, US 1-2 grade barrows and gilts averaged \$47.64 for 190-210 pounds, compared with \$48.30 for 210-240 and \$48.44 for 240-250. Thus, within grade, prices for 210-240 and 240-250 are the same, but prices are discounted at weights under 210 and over 250. Table 2 gives the cost per pound of feed and the ratio of feed costs to hog prices for

each corn price at hog prices of \$40, \$45, and \$50 per cwt (i.e., hog prices of 40, 45, and 50 cents per pound).

A second degree parabola was fit to the Nebraska feeding data to obtain a mathematical measure of the input-output relationship. This equation is (figure 1):

$$Y = 47.76 + .35807X - .000138X^2$$

where Y = average weight per hog

X = average amount of feed fed per hog

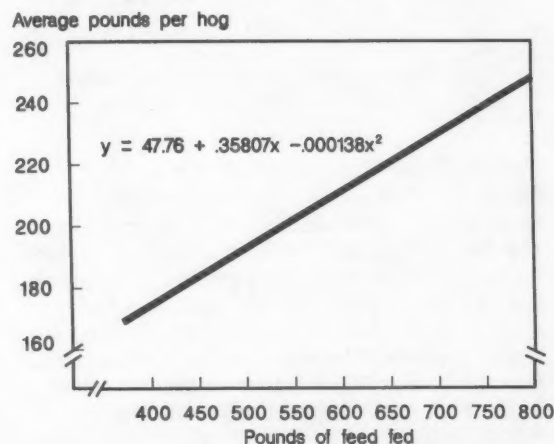
The first derivative of the input-output function is:

$$Y' = .35807 - .000276X$$

Table 2.—Feed prices and feed/hog price ratios

Price of corn	Feed cost		Total feed cost	Feed/hog price ratio when price of hogs per pound is:		
	Corn	Other		\$.40	\$.45	\$.50
Dol/bu	Dol/cwt	Ct/lb				
1.20	1.83	2.83	.0466	.1165	.1036	.0932
1.40	2.14	2.83	.0497	.1243	.1104	.0994
1.60	2.45	2.83	.0528	.1320	.1173	.1056
1.80	2.75	2.83	.0558	.1395	.1240	.1116
2.00	3.06	2.83	.0589	.1473	.1309	.1178
2.20	3.36	2.83	.0619	.1548	.1376	.1238
2.40	3.67	2.83	.0650	.1625	.1444	.1300
2.60	3.97	2.83	.0680	.1700	.1511	.1360
2.80	4.28	2.83	.0711	.1778	.1580	.1422
3.00	4.59	2.83	.0742	.1855	.1649	.1484

Figure 1
Feed Input and Weight Per Hog



^{3/} National Academy of Science, *Nutritional Requirements of Swine*, 8th ed., 1979, p. 22.

^{4/} *Agricultural Prices*, NASS, USDA, January 30, 1987, p. 63.

Table 3.—Quantity of corn fed at various corn prices

Price of corn	Total feed fed when price of hogs per pound is:			Quantity of corn fed when price of hogs per pound is:		
	\$.40	\$.45	\$.50	\$.40	\$.45	\$.50
Dol/bu	— — — Pounds — — —					
1.20	875	922	960	749	789	822
1.40	847	897	937	725	768	802
1.60	819	872	915	701	746	783
1.80	792	848	893	678	726	764
2.00	764	823	871	654	704	746
2.20	736	799	849	630	684	727
2.40	709	774	826	607	663	707
2.60	681	750	805	583	642	689
2.80	653	725	782	559	621	669
3.00	625	700	760	535	599	651

This derivative is a function of feed fed, and therefore will differ for each level of feed input. As the quantity of feed increases, the first derivative will become progressively smaller, reaching 0 at 1,297 pounds of feed, implying that the weight of hogs will reach a maximum at that point. However, this conclusion requires extending feed inputs and outputs far beyond the recorded observations, so inferences of what would have happened had the feeding period been extended are not reliable.

The feed cost/hog price ratios are inserted in the equation for the first derivative of the input-output function and solved for X, the quantity of feed input which will equate marginal feed cost to marginal revenue for the prices of feed and hogs. Corn comprises 85.6 percent of the complete ration, therefore multiplying .856 by the quantity of feed fed yields the quantity of corn fed. This step gives a relationship for the quantity of corn that will be fed at each respective price for corn, i.e., the demand for corn holding prices for other feed ingredients and hogs constant (table 3). A change in either hog prices or other feed ingredient prices will yield a different demand for corn.

Results

A linear equation was fitted to each of the demands for corn resulting from the change in hog prices. The linear equation gave an average R^2 of .99994. These equations are:

1. With hog prices at \$45 cwt:

$$Y = 915.7 - 105.56 X$$

2. With hog prices at \$50 cwt:

$$Y = 936.0 - 95.0 X$$

3. With hog prices at \$40 cwt:

$$Y = 891.7 - 118.89X$$

Where Y = quantity of corn fed

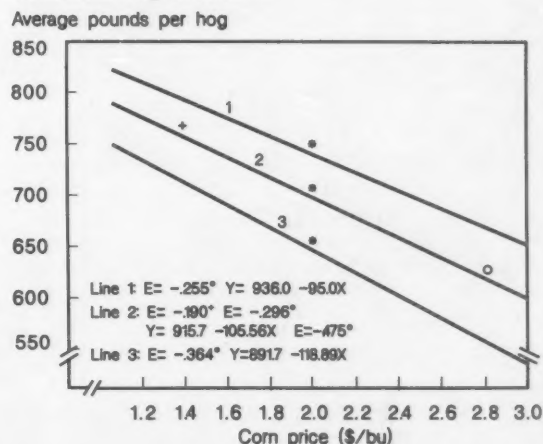
X = price of corn

These equations are illustrated in figure II.

The point elasticity of demand is calculated by multiplying the price coefficient of the above equations by the price/quantity ratio at the point for which the elasticity is desired. For example, the first derivative of demand for equation 1 is -105.56 and this multiplied by $.0028$ ($2.00/704$) gives an elasticity of $-.296$ at a price of \$2.00 a bushel and 704 bushels of corn fed. If the price of corn is decreased to \$1.40 a bushel, the elasticity is $-.190$ (more inelastic), and at a price of \$2.80 for corn, the elasticity is $-.475$ (less inelastic).

An increase in the price of hogs will increase the demand for corn, i.e., more corn will be used at each price or the same quantity

Figure 2
Demand for Corn in Finishing Hogs at Selected Hog Prices



of corn will be used at a higher price. However, the price elasticity will decrease with demand increases resulting from higher hog prices. For example, at \$50 per cwt for hogs, the elasticity is $-.255$ at a price of \$2.00 a bushel for corn. Conversely, a decrease in the price of hogs will decrease the demand for corn and result in a less inelastic demand. The price elasticity at \$40 cwt for hogs and \$2.00 for corn is $-.364$.

The use of the short-run demand derived from input-output data to estimate total use of corn in hog feeding requires a number of additional assumptions. One important assumption is the area of hog production that will use corn as the energy source in the ration, or in other words, the number of hogs to multiply times the derived demand to estimate total use of corn. A second assumption deals with whether the average input-output function has changed. The Van Arsdall and Nelson data were based on a survey covering 1980. Hogs finished in that year came from the fall pig crop of 1979 and the spring pig crop of 1980 which summed to a record high for hog feeding. For 1986, 20 percent fewer hogs were available for feeding than in 1980. If the reduction occurred because less efficient hog producers have

dropped out, a somewhat different input-output function might represent the average for hog feeding in 1986.

Conclusions

Feed input-output data provide an alternative approach to estimating short-run elasticities for input demands, providing the data represent average results achieved by feeders. The demand elasticities for other feed inputs in the ration, and the cross-elasticity of other feed input prices on corn, can be estimated by the same procedure. Although cycles in hog production may result in some shifts in the average input-output function, the resulting errors in estimates of the price elasticity of demand will be modest.

These results are similar to general conclusions about feed demand from econometric studies of disappearance data. However, the process of estimating total use of a feed ingredient in hog feeding from the short-run derived demand has its pitfalls. Chances for error are greater because of additional assumptions that must be made. Moreover, no method exists for measuring the potential errors.

THE EFFECTS OF GENERIC CERTIFICATES ON DOMESTIC CORN MARKETS

by

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Abstract: Generic certificates have released corn supplies from stocks that otherwise would have been unavailable to the marketplace. In so doing, certificates have held farm-level corn prices somewhat lower and pushed use higher than they otherwise would have been thus far in 1986/87. Market effects this summer will depend on whether exchanges for corn will be sufficient to push free supplies above anticipated disappearance. Although certificates have caused lower corn prices, when prices are below loan rates, the fixed dollar value of certificates, in conjunction with the loan program and the cash portions of deficiency payments, protects incomes of commodity program participants who fully use the loan program. Further, additional income gains can be achieved through alternative uses of certificates.

Keywords: Generic certificates, free stocks, corn prices, use, income.

A major goal of the Food Security Act of 1985 (FSA) is to achieve greater market orientation in the agricultural sector, and thereby price U.S. agricultural commodities more competitively in U.S. and world markets. With competitive prices, quantities of U.S. agricultural goods purchased here and abroad would be increased. Further, foreign producers—both in exporting and in importing countries—no longer would be encouraged to produce because of high U.S. price supports. In the long run, world supply and demand would be in better balance and the presence of the Government in U.S. agriculture would be reduced.

Several provisions of the FSA were designed to allow prices to reflect world supply and demand conditions more closely. The first and most significant provision allows the lowering of loan rates through the 1990/91 crop year for most major program commodities. Another provision gives the Secretary of Agriculture discretion to implement marketing loans for wheat, feed grains, and soybeans, and requires the Secretary to implement them for rice and cotton. An Export Enhancement Program

(EEP) requires that Commodity Credit Corporation (CCC) stocks be made available to make U.S. commodities more competitive for developing, maintaining, and expanding export markets.

The FSA also authorizes USDA to issue generic certificates in lieu of cash payments due program participants and merchants under provisions of several programs. Through April 15, CCC had issued \$7.3 billion of generic certificates (table 1). About \$6.4 billion were issued to farmers as deficiency and diversion payments, with corn payments accounting for about 47 percent and wheat payments, about 40 percent. An additional \$855 million were issued through other programs.

How Certificates Are Used

Certificates are generic because they can be exchanged for many program commodities, including wheat, rice, rye, corn, grain sorghum, barley, oats, soybeans, cotton, honey, and dairy products. Certificates are issued at a fixed dollar face value and have an 8-month life beginning at the end of the month of issuance.

Table 1.—Generic Certificate Availability

Issuance	Value
	\$ million
ACTUAL (April 1986–April 15, 1987)	
Deficiency and diversion payments	6,435
Other	855
Total	7,290
AUTHORIZED (April 16–August 1987) *	
1987 advance deficiency and diversion payments	465
1987 Conservation Reserve Program corn bonus payments	345
Export Enhancement and Targeted Export Assistance Programs	345
Total	1,155
TOTAL, ACTUAL AND AUTHORIZED	8,445
CERTIFICATE EXCHANGES (April 1986–April 15, 1987)	4,490
CERTIFICATE AVAILABILITY (April 16–August 1987)	3,955

* Remaining balances to be issued after April 15.

Certificates can be used in three ways:

- o Holders can obtain stocks that otherwise would be unavailable to the market. An individual farmer can use certificates to acquire commodities pledged as collateral to the Government under either 9-month, extended 9-month, Farmer-Owned Reserve (FOR), or Special Producer Storage Loan Program loans. Certificates also can be exchanged for commodities owned by the CCC, although the large minimum quantity required effectively limits these exchanges to merchants; certificate holders are allowed one less-than-minimum transaction from CCC-owned stocks per month.
- o Certificates can be sold or transferred. An active market for certificates has developed.
- o Certificates issued to farmers can be returned to the CCC by the original holders only, for cash at face value, during the sixth through the eighth month of the life of certificates. However, certificates issued through 1986 programs are subject to a 4.3-percent Gramm-Rudman-Hollings (GRH)

reduction if returned to the CCC for cash. Consequently, very few certificates issued through 1986 programs will be cashed in, since gains can usually be made from using them.

Some advantages of using certificates differ depending on whether the holder is a farmer or a merchant. However, there are several advantages common to all holders. Certificates give ready access to most program commodities. They can be easily sold or transferred to others. Certificates have a fixed dollar face value which protects holders when commodity prices decline. When posted county or redemption prices fall, the amount of commodity for which certificates can be exchanged increases.

There are some advantages specific to farmers. When the posted county price for a commodity is below its loan rate, as has been the case for corn in most locations during 1986/87, farmers can exchange certificates for the commodity under loan at the lower posted county price. When certificates are exchanged for commodities under loan, interest expenses that the CCC would have charged the farmer if the loan were repaid are forgone. If the acquired commodity is sold, any storage costs that would have accrued until the loan was repaid or defaulted on are eliminated.

Prior to harvest, farmers can free storage capacity by exchanging certificates for old-crop commodities under loan and then selling the commodity. If the posted county price in a given county is below the cash price, there are opportunities for arbitrage—exchanging and selling simultaneously to take advantage of the price differences.

For merchants, certificates also have several advantages. Certificates issued through the EEP and the Targeted Export Assistance (TEA) program allow domestic merchants to compete more effectively with foreign exporters. As for farmers, arbitrage opportunities exist for merchants if the CCC redemption price at a given location is below the cash price.

Certificates are cheaper for merchants to hold than commodities are, so marketing costs for storage, handling, and transportation are

reduced. For example, a merchant can acquire certificates anywhere in the United States and exchange them for available commodities at most CCC storage locations. The merchant incurs the cost of acquiring the certificates (if not EEP or TEA issuances) and transferring them to the point of exchange. Although costs for putting crops into storage are passed on to merchants, much of the other marketing costs up to the point of exchange in effect are being paid by CCC.

Because of these advantages, generic certificates are selling at a premium to their face value. Weekly average premiums have ranged from 2 to 7 percent of par values since January, down significantly from a peak of 25 to 30 percent in October, and below the 1986 average of about 12 percent.

How a farmer chooses to use certificates depends on market conditions regarding farm-level and posted county prices, loan rates, potential storage-cost savings, and certificate premiums. If farm-level and posted county prices exceed the loan rate or are below it in percentage terms by less than the premium percentage, then the farmer would be better off selling the certificates at the premium. The decision to sell the crop or to place it under loan would then depend on the relation between market prices and the loan rate.

When farm-level and posted county prices are below loan rates in percentage terms by more than the premium percentage, then the relationship between potential storage cost savings and certificate premiums must be considered. If the per-bushel storage cost as a percentage of the posted county price [in table 2, for example, $((\$0.20/\$1.40) * 100) = 14.3$] is greater than the premium value, the farmer would gain by using certificates to reacquire part or all of the corn under loan. However, if the per-bushel storage cost as a percentage of the posted county price is less than the premium, the farmer would be better off selling the certificates at a premium. Again, the farmer would then sell the crop or place it under loan depending on the relation between market prices and the loan rate.

Certificate Exchanges for Corn

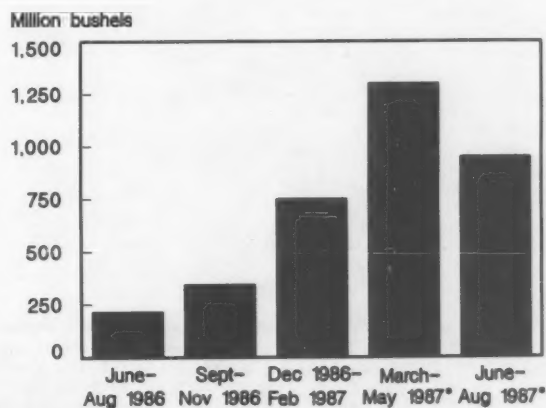
Certificates are being exchanged primarily for corn and wheat, which accounted

for about 80 percent of total exchanges in June–August 1986 and about 90 percent in September 1986–April 1987. Through mid-April this year, cumulative certificate exchanges for corn totaled 2,038 million bushels. Ninety-six percent of the corn acquired with certificates has come from stocks held as collateral for price support loans, rather than from CCC inventory. This indicates that nearly all exchanges for corn have been made by farmers using certificates issued directly to them or purchased from others.

Last summer, certificates were used to acquire 215 million bushels of corn (figure 1). Exchanges for corn rose to 344 million bushels in the September–November 1986 quarter, reflecting declining market prices, the beginning of loan placements, and the record-high placement of corn under loan. Exchanges for corn rose further in the winter quarter, reaching 751 million bushels, as tax considerations caused many farmers to wait until the new year to place corn under loan.

Until recently, farm-level and posted county prices for corn were well below the 1986 effective loan rate in most locations. Farmers placed corn under loan at \$1.84 a bushel and exchanged certificates for the loan collateral at the lower posted county price rather than at the loan rate. Many farmers have used certificates at the time of placement to reacquire part or all of the loan collateral, a practice referred to as "Quick

Figure 1
Corn Acquired With Certificates



*Projected.

PIK." They then sold or used the commodity and thereby saved on storage costs. Virtually all corn redeemed from 9-month loans has been freed through certificate exchanges—about 98 percent in September 1986–April 1987.

In mid-April, \$2.8 billion worth of generic certificates were outstanding. From mid-April through August 1987, CCC has authority to issue an additional \$1.2 billion in certificates. Consequently, certificates valued at about \$4 billion could be available for exchange during mid-April through August 1987.

Estimates of how much corn will be acquired this spring and summer with the \$4 billion of available certificates can be made using the following assumptions:

- o All certificates will be exchanged rather than returned to CCC for cash.
- o Each certificate issuance is assumed to be exchanged at a constant rate over its 8-month life. With the larger amount of outstanding certificates, this assumption implies that total exchanges will rise sharply this spring and remain higher in the summer, before tapering off as the

Table 2.—Certificate Options For a Corn Farmer *

Item	Scenario 1	Scenario 2	Scenario 3
	Use certificates to reacquire part or all of loan collateral	Sell certificates and forfeit loan collateral	Return certificates to CCC and forfeit loan collateral
A Effective loan rate	\$1.84	\$1.84	\$1.84
B Posted county price	\$1.40	\$1.40	\$1.40
C Farm price	\$1.40	\$1.40	\$1.40
D Certificate premium (percent)	10	10	NA
E GRH reduction (percent)	NA	NA	4.3
F Bushels placed under loan	10,000	10,000	10,000
G Loan revenue (A * F)	\$18,400	\$18,400	\$18,400
H Value of issued certificates	\$1,959	\$1,959	\$1,959
Advance deficiency payments	\$1,763	\$1,763	\$1,763
Advance paid diversion payment	\$195	\$195	\$195
I Bushels reacquired with certificates (H / B)	1,399	NA	NA
J Bushels forfeited to CCC (F - I)	8,601	10,000	10,000
K Per-bushel storage cost	\$0.20	\$0.20	\$0.20
L Total storage cost (J * K)	\$1,720	\$2,000	\$2,000
M Revenue from issued certificates			
Sell reacquired corn (C * I)	\$1,959	NA	NA
Sell certificates (H * (1 + (D / 100)))	NA	\$2,154	NA
Return certificates to CCC (H * (1 - (E / 100)))	NA	NA	\$1,874
N Total revenue (G - L + M)	\$18,638	\$18,554	\$18,274
O Per-bushel revenue (N / F)	\$1.86	\$1.86	\$1.83
P Cost of purchasing additional certificates at 10-percent premium ((B * J) * (1 + (D / 100)))	\$13,246	NA	NA
Q Additional sales revenue (C * J)	\$12,041	NA	NA
R Revenue reduction (Q - P)	(\$1,204)	NA	NA
S Storage cost saving (J * K)	\$1,720	NA	NA
T Net revenue increase (R + S)	\$516	NA	NA
U Total revenue (N + T)	\$19,154	NA	NA
Per-bushel revenue (U / F)	\$1.92	NA	NA

NA = not applicable.

* Totals may not add because of rounding. All scenarios as of October 1986. Assumes a 100-acre corn base. With the 17.5-percent set-aside requirement and 2.5-percent paid land diversion in effect for 1986, the farmer harvests 80 acres, on which the yield is assumed to be 125 bushels an acre. Program benefits are based on an average farm program payment yield of 107 bushels an acre. Following harvest in October 1986, the farmer places corn under loan and uses certificates that were issued in April and August as partial advance deficiency and diversion payments.

8-month life begins to end for certificates issued from December through March.

- o The share of certificates exchanged for corn is expected to fall from 80 percent in March-May to 70 percent in June-August, reflecting the end of 1986 corn loan placements and an increase in wheat exchange activity.
- o Normal weather is assumed here and abroad for the 1987 growing season.

Although the maximum potential storage-cost savings occur at harvest, reasons that certificates might be exchanged at other times of the year include cash flow needs of farmers, the need to free storage space prior to harvesting a new crop, the availability of certificates at different times, the 8-month life of certificates, and the availability of markets for the acquired commodity. While an individual farmer may have an incentive to exchange certificates at harvest and then sell the commodity to eliminate storage costs, in aggregate this would not be possible for all farmers at the same time since short-run demand could not absorb this increase in free supply.

Based on these assumptions, exchanges for corn this spring and summer could range from 2 to 2.3 billion bushels. An additional 200 to 500 million bushels could be freed to the market in the summer under FOR rotation provisions. However, corn loan placements during March-May are expected to be about 500 million bushels. Total disappearance is expected to be about 3.1 billion bushels in the spring and summer quarters. Consequently, these estimated exchanges may not be sufficient to push free supplies above anticipated needs for the remainder of 1986/87, and possibly could require prices to rise high enough to cause cash redemptions from loan obligations.

How Certificates Affect Markets

Generic certificates have their greatest effect on markets when they are exchanged, freeing stocks that otherwise would have been unavailable to the market. This is especially the case when market-clearing prices are below loan rates, since many advantages to using certificates, particularly for farmers,

exist only when posted county prices are below loan rates.

When prices are below loan rates, Government loan programs create a barrier to marketing crops under loan. Certificates effectively circumvent this barrier by allowing farmers to market crops that otherwise would have remained under loan. Although some Quick-PIK exchanges represent placements and acquisitions of commodities that otherwise would not have been placed, many Quick-PIK exchanges release stocks that would have been placed and left under loan, especially when prices are below the net loan rate (loan minus 9 months' storage costs).

When market prices are above loan, advantages to using certificates are reduced. But the need for certificates to help keep sufficient supplies on the market also is less, since equilibrium prices and marketings of stocks under loan are not constrained by the loan program. Because of this characteristic, certificates tend to be used for those commodities where the supply/demand imbalance is largest. When market prices exceed loan, only exchanges from the FOR, from Special Producer Storage loans, and from CCC stocks will free supplies that otherwise would have been unavailable to the market.

Except for the Quick-PIK exchanges for commodities that otherwise would not have been placed under loan, when generic certificates are exchanged for either loan or CCC stocks, these crops become additional free supplies. As certificates increase free supplies, prices fall and use rises. However, the increase in use generally is not as large as the amount exchanged, so the difference is stored. Initially, free stocks rise, but larger free stocks in turn raise non-free stocks by lowering the price of crops eligible for loan.

Although certificate-exchanged supplies cannot be placed under loan again, a substitution between free and non-free stocks can happen in two ways. First, eligible corn that might not have gone under loan may be placed under loan with lower prices. Second, because of lower prices, stocks under CCC loan that would have been redeemed and converted to free stocks may instead be left under loan, defaulted on, or placed in the Farmer-Owned Reserve, if open.

Generic certificates also affect markets before they are exchanged, because outstanding certificates represent a pool of potential free stocks that can be readily acquired.

Empirical Implementation

To quantitatively assess how generic certificates have affected corn markets, three assumptions are made. First, the short-term price elasticity of total demand is assumed to be -0.3. This assumption is based on short-run domestic demand elasticities derived from the corn subsector of a quarterly model for U.S. agriculture (2) and also on short-run export demand elasticities reported in a recent survey publication (1).

Second, to incorporate the substitution effect between free stocks and non-free stocks, it is assumed that except for Quick-PIK exchanges for commodities that otherwise would not have gone under loan, for each 100 bushels acquired with certificates but not absorbed by short-run market demands, and therefore remaining in free stocks, 20 to 50 other bushels that otherwise would have been free are displaced, going to or remaining in non-free positions. This means that free stocks rise by 50 to 80 bushels for each 100 bushels that are exchanged but not absorbed by short-run market demands, after adjusting for Quick-PIK exchanges that otherwise would not have been placed under loan.

Third, to link changes in supply, demand, free stocks, and non-free stocks to prices received by farmers, it is assumed that farm-level prices can be related to ratios of free stocks to use. This formulation of prices can be derived from a disequilibrium model and is estimated here in equations using a hyperbolic functional form. Separate hyperbolae are estimated for each crop-year quarter to reflect the different effects that stocks have on prices through the crop year. Also, various one-quarter autoregressive terms are included to reflect short-run stickiness of prices, largely due to the lag structures in underlying supply and demand functions. 1/ Deflated prices are used

1/ A further discussion of the hyperbolic functional form as applied to estimating quarterly price equations is given in Westcott, Hull, and Green (3, 4).

throughout. This results in the following general form for the estimated equations:

$$(1) \quad P = \sum_{i=1}^4 D_i [b_i \log(P) + c_i (S/U)^{-1}]$$

P is the national average quarterly price received by farmers, $\log(P)$ is the 1-quarter lag of prices, S denotes quarterly ending free stocks, and U denotes quarterly use. 2/ D_i represents four quarterly dummy variables and is set equal to 1 in the i^{th} crop-year quarter and 0 elsewhere, and b_i and c_i are parameters to be estimated. The subscript, i , denotes quarters in the crop year.

Note that because the hyperbolic functional form is used, the inverse of the ratio of free stocks to use is the appropriate explanatory variable in equation 1. Consequently, all parameter estimates are expected to be positive.

Table 3 presents the coefficients of the quarterly inverse ratios of free stocks to use in three estimates of the corn price equation, where the differences result from changes in the specification of the autoregressive terms. Because not all coefficients are statistically significant, three different equations are presented, yielding a range of coefficient

2/ The definition of free stocks used here includes privately held stocks not under loan. When prices exceed the loan rate plus interest charges, however, stocks under CCC loan also are included.

Table 3.—Corn price equation estimates *

Estimate number	Inverse free-stocks-to-use-ratio coefficient in:				R ²
	Sept-Nov	Dec-Feb	Mar-May	June-Aug	
(1)	0.346 (1.71)	0.064 (0.92)	0.072 (1.61)	0.015 (0.76)	0.85
(2)	-0.048 (0.40)	0.121 (1.73)	0.109 (2.44)	0.031 (1.58)	0.82
(3)	0 ---	0.136 (2.35)	0.119 (3.22)	0.035 (2.18)	0.82

--- = not applicable.

* The equations were estimated over 1976-1985; t-statistics are presented in parentheses.

estimates to use in the analysis. Further, because the coefficient for the September–November quarter in the second estimated equation was negative and the least significant, it is restricted to equal zero in the third estimate.

Two scenarios then were developed, one with generic certificates and one without. With the assumptions regarding demand elasticities and the substitution effect between free stocks and non-free stocks, we can determine how certificates affect market supplies, use, and free and non-free stocks and draw implications for prices in each crop-year quarter using the corresponding range of estimated coefficients. Because not all estimated coefficients in the price equations are statistically significant, resulting price impacts represent a judgmental consolidation of the range of derived point estimates.

Corn Market Effects Last Summer— An Illustration

Certificates were exchanged for 215 million bushels of corn last summer. None were Quick-PIK exchanges, since loan placements for 1985/86 corn were closed. It is estimated that outstanding certificates could have been exchanged for an additional 488 million bushels. Use in June–August 1986 was 957 million bushels. Ending free stocks were 194 million bushels, although the extended FOR rotation likely left free stocks at 225 to 250 million bushels. Further, since 50 to 80 percent of the outstanding certificates could be considered as a pool of free stocks, the effective level of free stocks was 460 to 630 million bushels. With a resulting effective free-stocks-to-use ratio between 0.48 to 0.66, farm-level corn prices averaged \$2.02 a bushel.

Without certificates, free stocks last summer would have been less than 225 to 250 million bushels because they were raised to that level after certificate exchanges. With the -0.3 short-run price elasticity of total demand and the range of 0.2 to 0.5 for the substitution effect between non-free and free stocks, it was estimated that free stocks without certificates would have been very tight—only 125 to 150 million bushels.

Therefore, without certificates, the ratio of free stocks to use would have been about 0.14 to 0.17. At these lower free stock levels,

corn prices would have been 35 to 45 cents a bushel higher in the summer quarter, and use would have been 40 to 50 million bushels lower. These results imply that without certificates, corn prices would have been 8 to 18 cents a bushel below the 1985 loan rate of \$2.55. This in turn suggests that expectations of a large corn crop, the extended FOR rotation, and reduced loan rates already in place for wheat, barley, and oats, also were holding corn prices below the 1985 loan rate, even without certificates, particularly towards the end of the summer quarter.

Corn Market Effects in 1986/87

Using this framework to assess the effects of certificates on corn markets for 1986/87 implies that corn price and use impacts are small early in the crop year because free stocks are seasonally high anyway.

Harvest-quarter impacts for corn last September–November are estimated to have been minimal, with prices reduced by less than 5 cents a bushel and use increased by about 10 million bushels because of certificates. In December–February, corn prices likely were lowered by 10 to 20 cents a bushel from what they would have been without certificates, and use increased by 40 to 70 million bushels.

With the higher level of certificate exchanges expected this spring and summer, additional supplies will be freed to the market. This spring, certificates have likely continued holding corn prices lower than they otherwise would have been, with use somewhat larger. As a result, generic certificates have moderated the seasonal movement of corn prices thus far in 1986/87. Typically, prices are lowest early in the crop year, then move higher as the year progresses. However, this year corn price movements have been flatter (see cover chart).

This summer, the effects of certificates on corn markets will depend on whether exchanges for corn will be sufficient to push free supplies above anticipated disappearance. If so, prices will continue to be held lower than they otherwise would have been and use will be somewhat higher. However, if certificate availability and exchanges for corn are not high enough to push free supplies above needs, corn prices will

have to rise to levels that would cause regular redemptions from loan obligations in the summer.

Effects on Farm Income

Although certificates have allowed lower corn prices, they have not reduced incomes for commodity program participants who fully use the loan program, even in the short run (table 4). To illustrate, income support for corn farmers under the 1986 program is comprised of three components—the loan rate, Findley payment, and basic deficiency payment.

On a per-bushel basis, the basic deficiency payment to corn farmers for the 1986 program is the difference between the target price of \$3.03 a bushel and the basic loan rate of \$2.40 a bushel. About 58 percent of 1986 basic deficiency payments for corn are being paid in cash, and 42 percent in certificates.

Findley payments, which are additional deficiency payments, are based on a further reduction in the loan rate from \$2.40 to \$1.92 a bushel, authorized under the so-called Findley provisions of the FSA. Final 1986 Findley payments for feed grains currently are scheduled for October 1987 and could be partly or wholly paid in certificates.

GRH reductions make the effective 1986-crop loan rate for corn \$1.84 a bushel. Loans made by the CCC are made in cash and reflect the GRH reductions.

The cash portions of the basic and the Findley deficiency payments also are subject to the GRH reduction, but no GRH reduction is made for portions paid in certificates (unless returned to the CCC for cash). Consequently, the issuance of certificates has increased funds available to 1986 program participants who fully use the loan program.

Table 4.—1986 Income for a Corn Farmer With and Without Certificates

	With the certificate program	Without a certificate program
EXAMPLE FOR A PROGRAM PARTICIPANT		
Base acres	100	100
Harvested acres	80	80
Effective loan rate	\$1.84	\$1.84
Loan payment ^{1/}	\$18,400	\$18,400
Storage costs ^{2/}	\$2,000	\$2,000
Return	\$16,400	\$16,400
Program benefits ^{3/}		
Paid land diversion	\$195	\$187
Deficiency payments		
Basic payments ^{4/}	\$5,257	\$5,161
Findley payments ^{5/}	\$4,020	\$3,932
Premium received on generic certificates ^{6/}	\$451	0
Income	\$26,323	\$25,680
EXAMPLE FOR A NONPARTICIPANT ^{7/}		
Harvested acres	100	100
National average price ^{8/}	\$1.40	\$1.42
Income	\$17,500	\$17,750

^{1/} Assumes a yield of 125 bushels an acre. ^{2/} Assumes storage costs over the 9-month loan life of 20 cents a bushel. ^{3/} Assumes a program yield of 107 bushels per acre. All cash benefits are subject to GRH reductions. ^{4/} About 58 percent in cash and 42 percent in certificates. ^{5/} Assumes 50 percent in cash and 50 percent in certificates. ^{6/} A 10-percent premium is assumed. Alternative gains to income are possible if the certificates are exchanged for corn under loan which then is sold, thereby reducing storage costs by an average of about \$291 at the assumed storage-cost rate. ^{7/} Assumes crop is sold in October 1986. ^{8/} The average farm price for corn in October 1986 was \$1.40 per bushel. Generic certificates reduced harvest quarter prices an estimated 0 to 5 cents per bushel.

Importantly, the value of certificates is protected against changes in posted county prices because certificates are issued in fixed dollar amounts. If commodity prices fall, certificates can be exchanged for an offsetting additional amount of commodity. Also, if farmers use certificates to acquire stocks under loan and then sell the acquired commodity, remaining storage costs that would have accrued during the life of the loan are eliminated and all interest expenses are forgone, increasing net incomes. Moreover, incomes of program participants may be enhanced even further through arbitrage or selling the certificates at a premium.

If corn prices this year had exceeded loan rates, marginally lower prices due to certificates could have reduced incomes of program participants because deficiency payments are paid on program yields rather than actual yields. However, farmers may have been able to recapture any reductions in income by selling the certificates at a premium.

In contrast, if there were no generic certificates, the loan rate portion of income support would be the same, but a participating corn farmer would have received the full deficiency and Findley payments in cash. For 1986 payments, since all cash payments would have been subject to the GRH reduction, this would have resulted in reduced funds available to the farmer. And, no additional income gains could have been achieved through alternative uses of certificates.

Farmers who have chosen not to participate in the commodity programs, and consequently are not provided any income support under the FSA, are adversely affected when prices fall. Many nonparticipants, however, raise livestock in addition to their crop operations. On these farms, grain is marketed indirectly through livestock feeding, thereby insulating nonparticipants from short-term adverse effects of lower prices.

Long-Run Demand

More competitive market prices are contributing to a long-run improvement in domestic demand for crops. For example, lower feed grain prices reduce the cost of producing meat, thereby encouraging expansion in the livestock industry.

Biological lags constrain the livestock sector in the short run. However, broiler production increases have accelerated recently, with output expected to be up 9 percent in 1987, compared with 4 percent in 1986. Commercial pork production is expected to be up about 8 percent in the second half of 1987, the first major gain since 1983. Further, cattle inventories are projected to stabilize over the next few years, ending a decline that began in 1982.

Lower market prices also are aiding U.S. competitiveness in agricultural export markets. This is being accomplished in two areas. First, competing producers are being sent a signal that the United States no longer will support global prices through high loan rates. To the extent that U.S. prices are below breakeven levels in competing producing countries, foreign-produced supplies may be diminished.

Second, competitive market prices for our agricultural products may allow the United States to recapture export market shares of a potentially growing trade market, thereby increasing export demand.

References

- (1) Gardiner, Walter H., and Praveen M. Dixit. *Price Elasticity of Export Demand: Concepts and Estimates*. Foreign Agricultural Economic Report 228, USDA, ERS, February 1987.
- (2) Westcott, Paul C., and David B. Hull. *A Quarterly Forecasting Model for U.S. Agriculture—Subsector Models for Corn, Wheat, Soybeans, Cattle, Hogs, and Poultry*. Technical Bulletin 1700, USDA, ERS, May 1985.
- (3) Westcott, Paul C., David B. Hull, and Robert C. Green. "Relationships between Quarterly Corn Prices and Stocks," *Agricultural Economics Research*, Vol. 37, No. 1, Winter 1985, pp. 1-7.
- (4) Westcott, Paul C., David B. Hull, and Robert C. Green. "Relationships Between Quarterly Wheat Prices and Stocks," *Wheat Outlook and Situation Report*, WS-268. USDA, ERS, June 1984, pp. 9-13.

CORN-BASED ETHANOL: SITUATION AND OUTLOOK

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Abstract: The U.S. fuel ethanol industry experienced an economic setback in 1986, largely because of a precipitous fall in crude oil prices. Although a decline in corn prices and a temporary feedstock subsidy offered by the U.S. Department of Agriculture were beneficial, Government tax exemptions remain an important component of industry status.

Fuel ethanol sales totaled 800 million gallons in 1986, a year-to-year gain of less than 1 percent. The growing market for ethanol as an octane enhancer was constrained by lower oil prices, which made petroleum-based octane alternatives more competitive.

The outlook for ethanol sales in 1987, though highly uncertain, suggests increased sales from 1986 if corn prices remain relatively low and/or oil prices continue to increase from their 1986 lows.

Keywords: Ethanol, crude oil, supply, demand, octane-enhancer, gasohol, imports, and subsidies.

Introduction

The Arab oil embargo of 1973 and the Iranian crisis of 1979 motivated the United States to develop alternative supplies of liquid transportation fuel based on domestically abundant renewable resources. Encouraged by Federal and State subsidies, fuel ethanol production has expanded rapidly since 1979. Fuel ethanol is the only alternative energy source that has contributed significantly to the Nation's transportation fuel supply. Fuel ethanol is used as gasohol (a blend of 10-percent ethanol and 90-percent unleaded gasoline) in existing automobile engines without engine modification. The 8 billion gallons of ethanol-gasoline blend consumed in 1986 accounted for about 8 percent of the U.S. gasoline market.

Fuel ethanol is also an octane enhancer. Blending one part ethanol with nine parts unleaded gasoline raises the octane content of the unleaded gasoline by about 3 points. The Environmental Protection Agency's (EPA) enforcement of its lead phase-down regulation

has created some demand for fuel ethanol as an octane booster to replace tetraethyl lead. The proposed elimination of lead from gasoline by 1988 may further augment this demand.

Corn, a domestically abundant resource, has emerged as the principal feedstock and is likely to dominate ethanol production for the foreseeable future. Corn is converted into ethanol using fermentation technology.

Despite substantial financial incentives from Federal and State Governments and the consequent rapid expansion of fuel ethanol production, the industry experienced a major economic setback in 1986 because of a fall in crude oil prices.

The situation and outlook for fuel ethanol is reviewed in this article in light of the following major developments during calendar 1986:

- A precipitous fall in crude oil prices which squeezed the profit margins of all fuel ethanol producers, causing some to cease operation or file for bankruptcy.

- A 22-percent decline in the average price of corn which helped cut ethanol production cost.
- A temporary feedstock subsidy provided by the U.S. Department of Agriculture (USDA) to help fuel ethanol producers over the economic stress caused by sharply lower oil prices.
- Extension of energy investment tax credits under the Tax Reform Act of 1986 allowed ethanol producers to write-off 15 percent of their capital expenditures in their first year (1986) and permits a 10 percent write-off in 1987.

Government Subsidies

The Federal Government and many States have enacted a variety of financial incentives, especially since the oil price shock of 1979, to encourage the development of a fuel ethanol industry based on domestically abundant renewable resources. The incentives have ranged from gasoline excise tax exemptions, investment tax credits, and loan guarantees to a temporary feedstock subsidy.

The following review of Federal incentives highlights the recent changes brought about by the Tax Reform Act of 1986.

Federal Incentives

<i>Provisions</i>	<i>Law before the Tax Reform Act of 1986</i>	<i>Law after the Tax Reform Act of 1986</i>
Excise tax exemption	<p>(a) An exemption for ethanol-gasoline blend (10 percent ethanol and 90 percent gasoline) of 6 cents per gallon from the 9 cents per gallon Federal motor fuel excise tax on gasoline. The exemption was scheduled to expire Dec. 31, 1992 (now extended to Sept. 30, 1993 by the Surface Transportation Act of 1986).</p> <p>(b) Fuels containing at least 85 percent ethanol, methanol or other alcohol will be exempted from the entire 9 cents per gallon federal excise tax if the alcohol is produced from substances other than petroleum or natural gas. The exemption was scheduled to expire Dec. 31, 1992 (now extended to Sept. 30,</p>	<p>(a) No change.</p> <p>(b) Exemption reduced to 6 cents per gallon effective Jan. 1, 1987.</p>

1993 by the Surface Transportation Act of 1986).

Blender tax credit

Individuals who sell or use blended alcohol in their trade or business may claim income tax credits of 60 cents per gallon of ethanol for 190 proof or above and 45 cents per gallon for alcohol of 150-189 proof. The amount claimed must be reduced by the amount of any Federal gasoline excise tax exemption. The exemption is scheduled to expire on Dec. 31, 1992.

No change.

Energy investment tax credit

The 10-percent energy investment tax credit was to expire on Dec. 31, 1985.

The energy investment tax credit was reinstated for 1986 and 1987 at 15 and 10 percent, respectively.

Business investment tax credit

A 10-percent business investment tax credit.

Repealed retroactive from Jan. 1, 1986.

USDA Feedstock Subsidy

In 1986, crude oil prices dropped about 50 percent, severely undercutting the profitability of fuel ethanol. On May 2, 1986, the USDA launched a temporary financial assistance for the fuel ethanol industry. Under this program, eligible ethanol producers earned Commodity Credit Corporation (CCC) commodity certificates by furnishing proof to the CCC that grain was removed from the market and processed into ethanol between May 10 and Sept. 30, 1986. For every 2.5 bushels of grain removed, producers earned the market value of one bushel of CCC-owned grain. To be eligible for the program, ethanol producers must have produced ethanol during March or April 1986.

State Incentives

As of March 1987, twenty eight States have legislation to give financial incentives to

fuel ethanol production. Most of these States have a strong agricultural base, and an interest in encouraging the production of fuel ethanol as an outlet for agricultural products. The laws differ considerably from State to State and are subject to frequent revisions. Some States exempt all fuel ethanol whether imported or domestic, others restrict exemptions to domestically produced fuel ethanol, and still others provide exemptions only for fuel ethanol produced within the State or in other States that have reciprocal clauses in their corresponding legislation. Figure 1 shows tax incentives by State; they range from 1 cent (Connecticut, Iowa, and Nevada) to 11 cents (New Mexico) per gallon of ethanol-gasoline blend. Most States offer 3 to 5 cents. Many States provide exemption from State gasoline excise and sales taxes, though some—Montana, Utah, Louisiana, and Virginia—offer producers an income tax credit.

The Federal Government levies a duty of 60 cents per gallon on fuel ethanol imports in

Figure 1

State Tax Exemptions for Gasohol, as of March, 1987 In Cents per Gallon



- N: No exemption
S: Exemption calculated as percent of sales
P: Producer's tax credit per gallon of ethanol

addition to a 3-percent ad valorem fee to avoid subsidizing foreign production. Individual States are not allowed to impose import duties or to legislate against importation. Thus, until 1985 certain countries (mostly Brazil) had been exporting ethanol to the U.S., with importers marketing it to States where the exemption was more favorable. Concerned State legislators rewarded their statutes to avoid subsidizing imports.

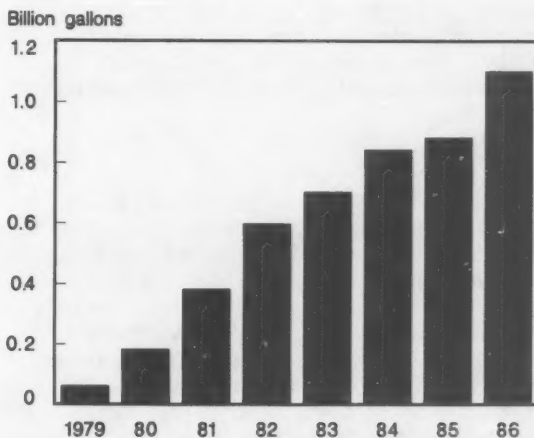
Fuel Ethanol Supply

Capacity

With the financial support provided by the Federal and State Governments, U.S. ethanol production capacity grew from 60 million gallons per year in 1979 to over 1 billion gallons in 1986 (figure 2). However, only 958 million gallons of capacity is currently in operable condition. Rapid growth occurred in fourth-quarter 1985 and the beginning of 1986, when nineteen ethanol production plants, ranging in capacity from 1.5 to 100 million

Figure 2

U.S. Fuel Ethanol Production Capacity



gallons per year, came on line or expanded production capacity.

The expansion partially resulted from producers' efforts to take advantage of the

Energy Investment Tax Credit, which was scheduled to expire at the end of 1985. The tax credit now has been reinstated under the Tax Reform Act of 1986 (P.L. 99-514). New facilities and plant expansions in 1986 added some 263 million gallons of production capacity. States where new facilities came on line include California, Louisiana, North Dakota, New Mexico, South Carolina, Tennessee, and Virginia. New capacity expansion in Illinois and Iowa was completed in existing plants in first-quarter 1986.

About 80 percent of the existing capacity consists of plants that range in capacity from 10 to 100 million gallons per year with one plant as large as 255 million gallons per year. However, the bulk of the production comes from large plants with annual capacity of 50 million gallons or more per year. Over 90 percent of the commercial fuel ethanol production capacity in the United States is located in Midwestern States. Almost all of the ethanol production in these States is derived from corn.

Production and Feedstock

Any material containing starch or fermentable sugar can be converted into ethanol by fermentation technology. Today, U.S. ethanol production uses feedstocks as diverse as grain, cheese whey, molasses, agricultural product waste, and forestry residues. However, corn is the dominant feedstock used, accounting for about 87 percent of U.S. ethanol production capacity.

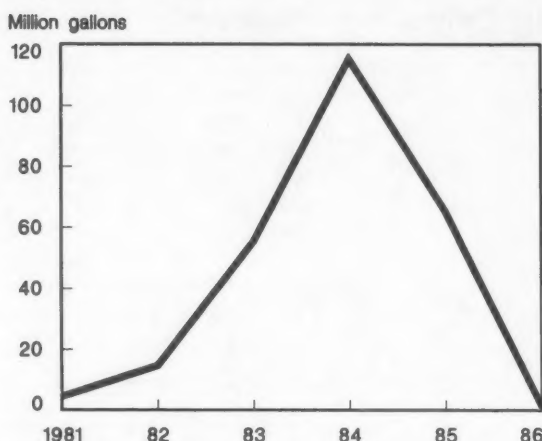
Imports

Fuel ethanol imports increased rapidly from 4 million gallons in 1981 to 115 million in 1984, but fell to 65 million gallons in 1985 as certain trade provisions used by foreign producers, were progressively closed. In 1986, imports came entirely from Jamaica and slowed to 1.3 million gallons following a sharp drop in the price of gasoline (figure 3). This trend is likely to continue in 1987, unless gasoline prices rebound sharply.

Economics of Production

Several factors affect the profitability of corn-based fuel ethanol production. The major factors include the price of corn, the

Figure 3
U.S. Fuel Ethanol Imports



size of the plant, the price of gasoline, and most critically, the availability of government subsidies. The price of corn is important because it represents 50-75 percent of the total cost per gallon of ethanol; the range depends upon the cost of the feedstock and the efficiency of the plant. The price of gasoline is important because it constrains the price that can be charged by ethanol producers to be competitive. The size of plant is important because there are significant economies of scale in the production of ethanol. The availability of government (Federal and State) subsidies, currently is essential for fuel ethanol to compete with unleaded gasoline or petroleum-based octane enhancers.

Fuel Ethanol Demand

Fuel ethanol is used principally as an octane enhancer by blending at a rate of 10 percent ethanol and 90 percent gasoline, the blend required to be eligible for Federal subsidy. Initially, most ethanol was used as a fuel extender in ethanol-gasoline blends, commonly known as gasohol. In recent years, ethanol has been promoted as an octane enhancer. Sales of gasohol increased rapidly following the enactment of the Crude Oil Windfall Profit Tax Act of 1980, which provided significant tax incentives for alcohol fuel production. From 800 million gallons in 1980, gasohol sales jumped to 4.3 billion gallons in 1983, and 5.7 billion in 1984, reaching 7.9 billion gallons in 1985 when world oil prices were well above current

levels. Gasohol sales in 1986 reached 8 billion gallons, a year-to-year gain of less than one percent (Fig. 4). In 1986, gasohol accounted for about 8 percent of the total gasoline market. However, crude oil prices began to plunge in 1986, following the breakdown of OPEC production quotas. As a result, gasoline prices fell sharply. To maintain their market share, ethanol producers were forced to cut prices to less than a dollar a gallon in the second half of 1986 (table 1).

Late in 1986, based on a new production agreement among OPEC members, crude oil

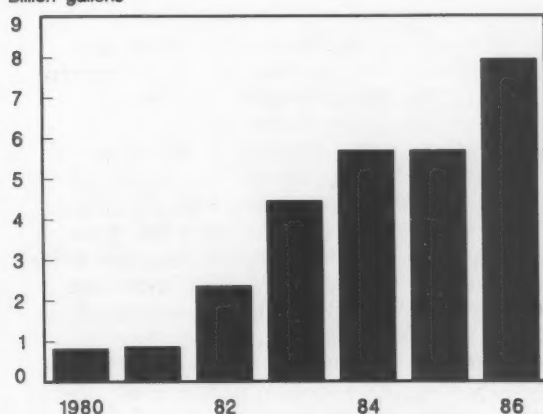
prices started firming up and gasoline prices began to rise. This development can help increase gasohol sales and improve the outlook for the alcohol fuel industry in 1987.

It appears future prospects for the U.S. fuel ethanol industry depend heavily on the prices of gasoline and corn and on continued government subsidies. Market penetration by fuel ethanol slowed because of increased competitiveness of gasoline as oil prices in the spot market plunged to as low as \$10 per barrel during 1986. Corn prices fell during 1986 but only 22 percent, compared to a more than 50-percent decline in gasoline prices.

Figure 4

Ethanol-Gasoline Blend Sales

Billion gallons



With an octane rating of 110-112, ethanol can be used in place of tetraethyl lead to increase the octane of unleaded gasoline. A 10-percent blend of ethanol with gasoline raises the octane content of the blend about 3 points. With existing Federal and State subsidies, ethanol is a competitive octane enhancing fuel additive. When the EPA announced in March 1985 that it would require the progressive phasing down of lead from 1.1 gram to 0.1 gram per gallon of gasoline by January 1986, ethanol producers expected a growing market for ethanol as an octane enhancer. This hope was reinforced by the expectation that the EPA might order the complete removal of lead from gasoline in 1988.

Table 1.—U.S. fuel ethanol prices by States and U.S. average, 1986

States	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Alabama	.63	1.43	1.24	1.09	1.11	1.13	1.04	0.89	1.01	0.82	0.76	0.76
Arkansas	1.65	1.32	1.10	1.02								
California	1.66	1.41	1.25	1.05	1.04	1.07	1.00	0.95	1.01	0.86	0.82	0.81
Florida	1.59	1.30	1.11	1.05	1.07	1.10	1.05	0.86	0.96	0.81	0.76	0.74
Illinois	1.56	1.35	1.25	1.11	1.11	1.17	1.02	0.89	0.96	0.81	0.74	0.72
Iowa	1.52	1.25	1.13	1.04	1.05	1.08	1.02	0.88	1.01	0.78	0.74	0.72
Kansas	1.59	1.34	1.35	1.26	1.26	1.28	1.07	0.89	0.97	0.83	0.80	0.79
Kentucky		1.41	1.29	1.22	1.24	1.26	1.15	0.95	1.06	0.91	0.85	0.85
Maryland	1.57	1.35	1.25	1.22	1.10	0.86	0.92	0.83	0.78	0.75	0.78	0.75
Michigan		1.22	1.05	0.98	1.00	1.06	0.96	0.87	0.97	0.80	0.75	0.72
Minnesota							1.05	0.93	0.97	0.85	0.81	0.79
Ohio	1.55	1.36	1.21	1.14	1.15	1.18	1.07	0.94	1.07	0.95	0.90	0.89
Tennessee	1.66	1.45	1.25	1.22	1.19	1.23	1.13	0.95	1.04	0.87	0.82	0.81
Washington	1.56	1.39	1.20	1.07	1.05	1.10	1.04	0.95	0.98	0.85	0.79	0.78
Wisconsin		1.22	1.04									
Indiana								0.86	0.98	0.84	0.82	0.81
U.S.	1.59	1.34	1.19	1.11	1.12	1.16	1.05	0.91	0.99	0.96	0.80	0.78

Source: Derived from Alcohol Outlook reports, published by Information Resources, Inc., Washington, D.C.

The required phasing down of the lead content of leaded gasoline combined with the retirement of older vehicles that required leaded gasoline have caused the share of the unleaded gasoline to rise from 46 percent in 1980 to about 68 percent in 1986. This change created an octane gap, that could be filled by: 1) More intensive refining of gasoline, which requires additional capital expenditure and energy, and lowers the yield of gasoline per gallon of crude oil, or 2) the use of alternative octane boosters, such as ethanol, methyl tertiary butyl ether (MTBE), and toluene. The option selected by each refiner depends upon many factors including plant age, location and configuration, capital cost and availability, crude oil cost and availability, and the cost and availability of alternative octane boosters. However, costs associated with increased refining are very sensitive to shifts in the price of crude oil (table 2). A fall in crude oil prices encourages refiners to upgrade their processing severity or to use petrochemical additives whose costs are largely derived from crude oil prices. While integrated producers might find more intensive refining to be the desirable option, independent refiners and gasoline companies that do not have the facilities to generate higher octane through refining must select among alternate octane boosters based on relative cost.

Although the 800 million gallons of ethanol used in 1986 displaced the octane equivalent of 4 billion grams of lead (one gallon of alcohol is equivalent to approximately 5 grams of lead in terms of the level of octane boost achieved), much of the

octane gap appears to have been filled either by more intensive refining of crude oil or by petrochemical based alternatives such as MTBE. These alternatives received a boost in 1986 due to the precipitous fall in the gasoline prices. Moreover, the use of ethanol suffers from some drawbacks, such as phase separation in the presence of water, making it less suitable for pipeline distribution. These and other drawbacks reportedly affected the acceptance of ethanol as an octane enhancer.

The growth in ethanol sales dropped in 1986. However, the outlook for expanded use of ethanol as an octane enhancer during 1987 should improve if gasoline prices continue to firm up, and providing ethanol feedstock costs don't escalate.

Environmental Effects

Fuel ethanol is cleaner environmentally compared with gasoline. Automobiles using ethanol-gasoline blends emit less carbon monoxide and hydrocarbon pollutants than automobiles using straight gasoline. Ethanol is an oxygenated fuel. Typically gasohol contains more oxygen than gasoline, which promotes more complete combustion, and helps reduce exhaust emissions. Studies conducted by EPA, the Colorado Dept. of Health, and the California Air Resources Board have demonstrated carbon monoxide reductions averaging up to 20-25 percent in exhaust emissions with the use of 10-percent ethanol blended fuel. Because of these environmental benefits, Colorado, New Mexico, and Arizona are considering a mandatory ethanol blend programs. If the programs come about, they will help boost demand for ethanol.

On the other hand, alcohol blends also have environmental problems. Evaporative hydrocarbons contribute significantly to ozone problems and alcohol blends are significantly more volatile than gasoline. Currently, EPA's gasohol waiver permits the use of 10-percent ethanol, by volume, to be blended in unleaded gasoline with no volatility controls. Currently, research on a number of factors, including volatility, are under way, but results are not yet available.

Table 2.—Improvement cost by processing

Crude oil Dollar/barrel	Unleaded Cents/ON gallon
40	1.1
35	1.0
30	0.8
25	0.7
20	0.5
15	0.4

Cents/ON gallon = Cents per octane number per gallon

Source: Unzelman, George H "Volatility - key to Alcohol use" Hydrocarbon Processing (May, 1986), pp. 35-36

References

1. Information Resources Inc., 499 South Capital Street, Washington, DC. "Alcohol Outlook". May-August, 1986.
2. Information Resources Inc., 499 South Capital Street, Washington, DC. "Alcohol Outlook". April 1987
3. Bureau of The Census, U.S. Department of Commerce.
4. U.S. Department of Agriculture, Agriculture Stabilization and Conservation Service, Commodity Credit Corporation.
5. Eric Vaughn, President and Chief Executive Officer, Renewable Fuels Association. Remarks before the 1986 National Conference on Fuel Ethanol and Gasoline Additives, Sept. 30 - Oct. 2, 1986, Hyatt Regency Capitol Hill, Washington, DC.
6. Mohinder Gill and Edward Allen. "Status of the U.S. Ethanol Market". Service, U.S. Department of Agriculture. August 1985, pp. 14-21
7. Brad Van Tassel, Mekinsey and Company, Inc. "U.S. Octane Outlook". Presented in 1986 National Conference on Ethanol and Gasoline Additives at Hyatt Regency Capitol Hill, Washington, D.C. September 1986.
8. Muller Associates, Inc, Consulting Engineers. "Gasoline Octane Enhancement: Technology, Economics, and Environmental Health and Safety Consideration". DOE/PE/72013-1, prepared for the U.S. Department of Energy, July 1985.
9. U.S. Department of Energy, Energy Information Administration. "Petroleum Marketing Monthly". DOE/EIA - 0380(86/12). December 1986.
10. Eric Vaughn, President-Renewable Fuel Association. "Ethanol, America's Proven Liquid Fuel Alternative". Biologue and the Regional Biomass Energy Program Reports Vol. 4, No. 2. March/April 1987.
11. James H. Hauver. "Ethanol As an Octane Enhancer". Draft Report. September 1986.
12. Information Resources Inc., 499 South Capital Street, Washington, D.C. "Alcohol Fuel-Octane Data Base" 1987.

Table 1.--Feed grains: Marketing year supply

Year 2/	Supply				Domestic	
	Begin- ning stocks	Produc- tion	Imports	Total	Food, alcohol, and industrial	Seed
						Million
1975/76	21.1	185.0	0.4	206.5	16.5	1.5
1976/77	23.9	194.0	0.3	218.2	17.1	1.6
1977/78	36.9	205.3	0.3	242.5	18.0	1.5
1978/79	50.3	221.5	0.3	272.1	19.2	1.4
1979/80	57.7	237.9	0.3	295.9	20.0	1.4
1980/81	63.8	197.9	0.3	262.0	22.1	1.3
1981/82	44.2	246.2	0.3	290.7	24.0	1.4
1982/83	78.0	250.2	0.3	328.5	26.5	1.4
1983/84	108.6	136.4	0.7	245.7	28.3	1.5
1984/85	39.6	236.9	0.8	277.3	30.6	1.5
1985/86	57.5	274.4	0.9	332.8	33.5	1.5
1986/87	126.3	252.4	0.6	379.3	- - 35.7 - -	
1987/88 4/	157.2	219.0	0.7	376.9	- - 36.4 - -	

1/ Aggregated data on corn, sorghum, barley, and oats. 2/ The marketing year for corn, sorghum, and barley, June 1. 3/ Includes total Government loans (original and resale).

supply and disappearance, 1975/76-1987/88 1/

Disappearance			Ending stocks		
Domestic use	:	Total	:	Privately:	Total
: Seed : Feed : and : Total	:	:Exports : disap- : Govt. : owned : Total	:	3/	:
: :residual :	:	:	:	:	:

Million metric tons

1.5	115.4	133.4	49.2	182.6	0.4	23.5	23.9
1.6	112.5	131.2	50.1	181.3	---	36.9	36.9
1.5	117.1	136.6	55.6	192.2	0.2	50.1	50.3
1.4	134.3	154.9	59.5	214.4	3.8	53.9	57.7
1.4	139.7	161.1	71.0	232.1	7.8	56.0	63.8
1.3	123.9	147.3	70.5	217.8	7.3	36.9	44.2
1.4	127.4	152.8	59.9	212.7	8.3	69.7	78.0
1.4	139.0	166.9	53.0	219.9	33.5	75.1	108.6
1.5	119.7	149.5	56.6	206.1	8.0	31.6	39.6
1.5	131.1	163.2	56.6	219.8	8.9	48.6	57.5
1.5	134.9	169.9	36.6	206.5	20.4	105.9	126.3
7 - -	140.6	176.3	45.8	222.1	55.7	101.5	157.2
4 - -	143.3	179.7	49.1	228.8			148.1

marketing year for corn and sorghum begins September 1; for oats and
residual). 4/ Projected.

Table 2.—Corn: Marketing year supply and disappearance

Year beginning September 1	Supply				Domestic use		
	Begin- ning stocks	Produc- tion	Imports	Total	Food, alcohol, and industrial	Seed	For res
	:	:	:	:	:	:	:
							Million
1982/83							
Sept.-Nov.	2,536.6	8,235.1	0.3	10,772.0	217.5	—	1,2
Dec.-Feb.	8,906.3	—	0.1	8,906.4	201.6	—	1,2
Mar.-May	6,899.2	—	0.2	6,899.4	226.6	11.6	1,2
June-Aug.	4,923.9	—	0.1	4,924.0	234.6	2.9	7
Mkt. year	2,536.6	8,235.1	0.7	10,772.4	880.3	14.5	4,5
1983/84							
Sept.-Nov.	3,523.1	4,174.7	0.5	7,698.3	238.6	—	1,3
Dec.-Feb.	5,651.7	—	0.6	5,652.3	222.8	—	1,0
Mar.-May	3,865.0	—	1.0	3,866.0	247.3	16.8	9
June-Aug.	2,145.1	—	0.6	2,145.7	247.3	2.3	5
Mkt. year	3,523.1	4,174.7	2.7	7,700.5	956.0	19.1	3,8
1984/85							
Sept.-Nov.	1,006.3	7,674.0	0.9	8,681.2	249.7	—	1,2
Dec.-Feb.	6,631.1	—	0.4	6,631.5	241.5	—	1,1
Mar.-May	4,623.2	—	1.1	4,624.3	283.8	17.0	1,0
June-Aug.	2,835.5	—	1.1	2,836.6	295.0	4.2	5
Mkt. year	1,006.3	7,674.0	3.5	8,683.8	1,070.0	21.2	4,0
1985/86							
Sept.-Nov.	1,648.2	8,876.7	1.0	10,525.9	278.0	—	1,2
Dec.-Feb.	8,614.7	—	1.3	8,616.0	264.0	—	1,2
Mar.-May	6,587.1	—	2.3	6,589.4	293.0	16.1	1,0
June-Aug.	4,990.0	—	6.0	4,996.0	305.0	3.4	4
Mkt. year	1,648.2	8,876.7	10.6	10,535.5	1,140.0	19.5	4,0
1986/87							
Sept.-Nov.	4,039.5	8,252.8	0.8	12,293.1	280.0	—	1,3
Dec.-Feb.	10,304.1	—	0.3	10,304.4	270.0	—	1,1
Mar.-May							
June-Aug.							
Mkt. year 2/	4,039.5	8,252.8	3.0	12,295.3	- 1,180.0 -		4,5
1987/88							
Mkt. year 2/	5,115.0	7,200.0	5.0	12,320.0	- 1,200.0 -		4,6

1/ Includes quantity under loan and farmer-owned reserve. 2/ Projected.

disappearance, specified periods, 1982/83-1987/88

Disappearance				Ending stocks			
estic use	:	:	:	Total	:	Privately:	:
ed :	Feed :	:	Exports :	disap-	Govt. :	owned :	Total
ed :	and :	Total :	:	pearance:	owned :	l/ :	:
:	residual :	:	:	:	:	:	:

Million bushels

---	1,202.0	1,419.5	446.2	1,865.7	372.0	8,534.3	8,906.3
---	1,293.6	1,495.2	512.0	2,007.2	470.8	6,428.4	6,899.2
6	1,258.3	1,496.5	479.0	1,975.5	491.7	4,432.2	4,923.9
9	766.8	1,004.3	396.6	1,400.9	1,142.7	2,380.4	3,523.1
5	4,520.7	5,415.5	1,833.8	7,249.3	1,142.7	2,380.4	3,523.1
---	1,311.0	1,549.6	497.0	2,046.6	1,227.0	4,424.7	5,651.7
---	1,056.0	1,278.8	508.5	1,787.3	1,214.0	2,651.0	3,865.0
8	939.5	1,203.6	517.3	1,720.9	195.0	1,950.1	2,145.1
3	511.1	760.7	378.7	1,139.4	201.5	804.8	1,006.3
1	3,817.6	4,792.7	1,901.5	6,694.2	201.5	804.8	1,006.3
---	1,294.2	1,543.9	506.2	2,050.1	206.7	6,424.4	6,631.1
---	1,182.9	1,424.4	583.9	2,008.3	209.7	4,413.5	4,623.2
0	1,009.1	1,309.9	478.9	1,788.8	221.7	2,613.8	2,835.5
2	592.8	892.0	296.4	1,188.4	224.9	1,423.3	1,648.2
2	4,079.0	5,170.2	1,865.4	7,035.6	224.9	1,423.3	1,648.2
---	1,215.5	1,493.5	417.7	1,911.2	388.6	8,226.1	8,614.7
---	1,299.6	1,563.6	465.3	2,028.9	509.4	6,077.7	6,587.1
1	1,085.9	1,395.0	204.4	1,599.4	550.9	4,439.1	4,990.0
4	494.3	802.7	153.8	956.5	545.7	3,493.8	4,039.5
5	4,095.3	5,254.8	1,241.2	6,496.0	545.7	3,493.8	4,039.5
---	1,387.9	1,667.9	321.1	1,989.0	968.2	9,335.9	10,304.1
---	1,472.2	1,742.2	315.4	2,057.6	1,362.2	6,884.6	8,246.8
-	4,550.3	5,730.3	1,450.0	7,180.3	1,700.0	3,415.0	5,115.0
-	4,650.0	5,850.0	1,600.0	7,450.0			4,870.0

ected.

Table 3.—Sorghum: Marketing year supply and disappearance

Year beginning September 1	Supply				Domestic use		
	Begin- ning stocks	Produc- tion	Imports	Total	Food, alcohol, and industrial	Seed	Other
							Million
1982/83							
Sept.-May	318.6	835.1	0	1,153.7	6.0	0.9	4
June-Aug.	529.1	0	0	529.1	1.9	0.9	4
Mkt. year	318.6	835.1	0	1,153.7	7.9	1.8	4
1983/84							
Sept.-May	439.1	487.5	0	926.6	5.7	1.1	3
June-Aug.	368.9	0	0.1	369.0	2.0	1.2	3
Mkt. year	439.1	487.5	0.1	926.7	7.7	2.3	3
1984/85							
Sept.-May	287.4	866.2	0.1	1,153.7	12.4	1.5	5
June-Aug.	360.8	0	0	360.8	2.9	0.5	5
Mkt. year	287.4	866.2	0.1	1,153.7	15.3	2.0	5
1985/86							
Sept.-May	300.2	1,120.3	0	1,420.5	22.1	1.2	6
June-Aug.	630.0	0	0	630.0	3.9	0.5	6
Mkt. year	300.2	1,120.3	0	1,420.5	26.0	1.7	6
1986/87							
Sept.-May							
June-Aug.							
Mkt. year 2/	551.0	941.6	0	1,492.6	- 28.0 -		5
1987/88							
Mkt. year 2/	738.0	678.0	0	1,416.0	- 30.0 -		4

1/ Includes quantity under loan and farmer-owned reserve. 2/ Projected.

d disappearance, specified periods, 1982/83-1987/88

Disappearance				:	Ending stocks		
stic use	:	:	:	Total	:	Privately:	:
: Feed	:	:	:Exports	: disap-	:Govt.	: owned	: Total
Seed	and	Total	:	pearance	owned	1/	:
:residual	:	:	:	:	:	:	:

Million bushels							
0.9	453.5	460.4	164.2	642.6	54.0	475.1	529.1
0.9	41.3	44.1	45.9	90.0	171.5	267.6	439.1
1.8	494.8	504.5	210.1	714.6	171.5	267.6	439.1
1.1	356.5	363.3	194.4	557.7	78.0	290.9	368.9
1.2	28.2	31.4	50.2	81.6	102.8	184.6	287.4
2.3	384.7	394.7	244.6	639.3	102.8	184.6	287.4
1.5	542.2	556.1	236.8	792.9	111.1	249.7	360.8
0.5	-2.9	0.5	60.1	60.6	112.1	188.1	300.2
2.0	539.3	556.6	296.9	853.5	112.1	188.1	300.2
1.2	626.9	650.2	140.3	790.5	181.4	447.5	630.0
0.5	36.9	41.3	37.7	79.0	207.2	343.8	551.0
1.7	663.8	691.5	178.0	869.5	207.2	343.8	551.0
	501.6	529.6	225.0	754.6			738.0
	499.0	529.0	225.0	754.0			662.0

ected.

Table 4.—Barley: Marketing year supply and disappearance

Year beginning June 1	Supply				Domestic use	
	Beginning	Production	Imports	Total	Food, alcohol, and industrial	Seed
	stocks					
						Million bushels
1975/76	92.0	379.2	15.7	486.9	130.5	15.7
1976/77	128.4	383.0	10.8	522.2	137.0	18.2
1977/78	126.4	427.8	9.4	563.6	138.6	16.7
1978/79	173.1	454.8	10.5	638.4	153.7	13.6
1979/80	228.0	383.2	11.8	623.0	157.9	14.0
1980/81	192.1	361.1	10.2	563.4	162.3	13.2
1981/82	137.3	473.5	9.6	620.4	158.0	16.3
1982/83	147.8	515.9	10.7	674.4	152.7	17.4
1983/84	216.7	508.9	7.1	732.7	149.5	19.5
1984/85	189.4	599.2	10.1	798.7	149.0	21.6
1985/86	247.4	591.4	9.0	847.8	147.2	21.4
1986/87	324.8	610.5	5.0	940.3	- 174.0 -	
1987/88 ^{3/}	315.0	546.0	5.0	866.0	- 175.0 -	

1/ Quarterly supply and disappearance estimates discontinued because base year changed.

2/ Includes quantity under loan and farmer-owned reserve. 3/ Projected.

Table 5.—Oats: Marketing year supply and disappearance

Year beginning June 1	Supply				Domestic use	
	Beginning	Production	Imports	Total	Food and industrial	Seed
	stocks					
						Million bushels
1975/76	224.0	639.0	0.7	863.7	44.0	42.7
1976/77	204.8	540.4	1.4	746.6	42.4	45.9
1977/78	164.3	752.8	2.2	919.3	42.0	42.5
1978/79	313.1	581.7	0.7	895.5	41.0	36.1
1979/80	280.0	526.7	0.9	807.6	40.7	34.6
1980/81	236.4	458.8	1.3	696.5	41.0	33.0
1981/82	177.0	509.5	1.6	688.1	41.2	35.4
1982/83	151.9	592.6	3.9	748.4	41.7	43.3
1983/84	219.8	477.0	30.1	726.9	40.9	31.9
1984/85	181.1	473.7	34.0	688.8	41.0	34.6
1985/86	179.9	520.8	27.5	728.2	44.0	38.4
1986/87	183.7	384.5	30.0	598.2	- 85.0 -	
1987/88 ^{3/}	112.0	482.0	30.0	624.0	- 85.0 -	

1/ Quarterly supply and disappearance estimates discontinued because base year changed.

2/ Includes quantity under loan and farmer-owned reserve. 3/ Projected.

and disappearance, area, and prices, 1975/76-1987/88 1/

Disappearance				Ending stocks May 31			
Domestic use				Privately:			
: Feed	:	:	: Exports	: Total	: Govt.	: owned	: Total
: Seed and	:	: Total	:	: disappearance	: owned	: 2/	:
: residual	:	:	:	:	:	:	:

Million bushels

15.7	188.5	334.7	23.8	358.5	---	128.4	128.4
18.2	174.4	329.6	66.2	395.8	---	126.4	126.4
16.7	178.0	333.3	57.2	390.5	---	173.1	173.1
13.6	217.4	384.7	25.7	410.4	2.5	225.5	228.0
14.0	204.2	376.1	54.8	430.9	3.2	188.9	192.1
13.2	173.9	349.4	76.7	426.1	3.4	133.9	137.3
16.3	198.2	372.5	100.1	472.6	3.3	144.5	147.8
17.4	240.4	410.5	47.2	457.7	6.0	210.7	216.7
19.5	282.8	451.8	91.5	543.3	11.9	177.5	189.4
21.6	303.9	474.5	76.8	551.3	14.6	232.8	247.4
21.4	332.6	501.2	21.8	523.0	57.4	267.4	324.8
-	301.3	475.3	150.0	625.3			315.0
-	305.0	480.0	125.0	605.0			261.0

because barley has been dropped from quarterly grain stocks survey.
projected.

and disappearance, area, and prices, 1975/76-1987/88 1/

Disappearance				Ending stocks May 31			
Domestic use				Privately:			
: Feed	:	:	: Exports	: Total	: Govt.	: owned	: Total
: Seed and	:	: Total	:	: disappearance	: owned	: 2/	:
: residual	:	:	:	:	:	:	:

Million bushels

42.7	558.5	645.2	13.7	658.9	24.9	179.9	204.8
45.9	484.4	572.7	9.6	582.3	---	164.3	164.3
42.5	509.4	593.9	12.3	606.2	---	313.1	313.1
36.1	525.7	602.8	12.7	615.5	2.7	277.3	280.0
34.6	491.8	567.1	4.1	571.2	2.7	233.7	236.4
33.0	432.2	506.2	13.3	519.5	2.3	174.7	177.0
35.4	453.0	529.6	6.6	536.2	0.7	151.2	151.9
43.3	440.6	525.6	3.0	528.6	0.7	219.1	219.8
31.9	470.9	543.7	2.1	545.8	1.5	179.6	181.1
34.6	432.0	507.6	1.3	508.9	1.4	178.5	179.9
38.4	459.9	542.3	2.2	544.5	1.9	181.8	183.7
-	399.2	484.2	2.0	486.2			112.0
-	405.0	490.0	2.0	492.0			132.0

because oats has been dropped from quarterly grain stocks survey.
projected.

Table 6.—Average prices received by farmers, United States, by months, 1981/82-86/87 1/

Year beginning September 1	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Average weighted by sales 2/
Dollars per bushel													
Corn													
1981	2.55	2.45	2.34	2.39	2.54	2.44	2.46	2.55	2.60	2.57	2.50	2.30	2.47
1982	2.15	1.98	2.13	2.26	2.36	2.56	2.71	2.95	3.03	3.04	3.13	3.35	2.55
1983	3.32	3.15	3.17	3.15	3.15	3.11	3.21	3.32	3.34	3.36	3.30	3.12	3.21
1984	2.90	2.65	2.55	2.56	2.64	2.62	2.67	2.70	2.68	2.64	2.60	2.44	2.63
1985	2.29	2.11	2.21	2.29	2.33	2.32	2.29	2.30	2.39	2.32	2.00	1.73	2.23
1986	1.45	1.40	1.47	1.50	1.47	1.42	1.47	*1.49					
Dollars per cwt													
Sorghum													
1981	4.07	3.90	3.87	3.95	4.09	4.08	4.00	4.10	4.35	4.17	3.96	3.95	4.01
1982	3.80	3.70	3.78	3.97	4.09	4.42	4.67	4.92	5.05	5.05	5.03	5.29	4.41
1983	5.26	5.01	4.98	4.93	4.92	4.74	4.85	5.00	5.08	4.94	4.64	4.58	4.89
1984	4.24	4.05	4.05	4.15	4.16	4.10	4.24	4.46	4.54	4.52	4.04	3.74	4.15
1985	3.27	3.30	3.47	3.76	3.69	3.55	3.67	3.80	3.99	3.43	3.06	2.66	3.45
1986	2.36	2.34	2.38	2.41	2.37	2.36	2.45	*2.51					
Year beginning June 1	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Average weighted by sales 2/
Dollars per bushel													
Oats													
1981	1.99	1.84	1.72	1.74	1.78	1.88	1.94	1.97	1.99	2.02	1.99	1.99	1.88
1982	1.88	1.57	1.39	1.35	1.32	1.40	1.44	1.46	1.48	1.49	1.54	1.54	1.49
1983	1.51	1.46	1.45	1.55	1.62	1.67	1.73	1.81	1.88	1.81	1.82	1.84	1.62
1984	1.80	1.68	1.62	1.60	1.69	1.64	1.72	1.74	1.69	1.68	1.68	1.60	1.67
1985	1.59	1.31	1.16	1.10	1.08	1.17	1.20	1.18	1.16	1.14	1.13	1.21	1.23
1986	1.10	.90	.86	.99	1.11	1.32	1.44	1.46	1.47	1.46	*1.43		
Barley													
1981	2.94	2.41	2.37	2.44	2.38	2.49	2.48	2.50	2.40	2.40	2.42	2.53	2.48
1982	2.39	2.16	2.20	2.17	1.98	2.06	2.19	2.16	2.00	2.09	2.22	2.36	2.18
1983	2.32	2.20	2.34	2.46	2.53	2.55	2.55	2.55	2.47	2.50	2.54	2.78	2.47
1984	2.61	2.54	2.26	2.25	2.29	2.25	2.19	2.24	2.21	2.18	2.16	2.22	2.29
1985	2.14	2.08	1.98	1.88	1.96	2.05	2.07	2.05	1.95	1.88	1.85	1.73	1.98
1986	1.57	1.67	1.51	1.45	1.58	1.69	1.61	1.60	1.63	1.69	*1.66		
Year beginning May 1	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Average weighted by sales
Dollars per ton													
Hay (mid-month)													
1981	75.30	66.90	64.00	63.90	62.70	64.80	65.40	65.70	67.90	69.90	69.50	73.30	67.30
1982	77.50	69.60	66.10	65.00	66.80	67.10	68.70	68.60	70.30	73.20	69.90	74.00	69.30
1983	78.10	72.70	71.20	71.20	74.70	76.80	75.10	76.70	76.60	78.70	79.40	79.80	75.80
1984	82.50	76.10	72.40	70.40	70.70	73.10	71.40	73.40	73.00	73.10	72.20	72.50	72.70
1985	80.80	70.20	67.90	65.20	67.10	67.50	64.30	65.40	65.80	66.70	67.10	66.20	67.60
1986	70.30	61.50	58.40	58.10	57.80	56.90	56.00	56.80	55.40	58.10	57.90	62.90	60.10

1/ Prices do not include an allowance for loans outstanding and government purchases. 2/ U.S. average prices based on U.S. monthly prices weighted by monthly marketings. *Preliminary.

Source: Agricultural Prices, Agricultural Statistics Board, USDA.

Table 7.—Cash prices at principal markets, 1981/82-86/87

Year beginning September 1	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Simple average
Dollars per bushel													
CORN No. 2 Yellow, St. Louis													
1981	2.61	2.53	2.59	2.54	2.65	2.61	2.66	2.78	2.78	2.75	2.68	2.42	2.63
1982	2.32	2.12	2.43	2.49	2.52	2.79	2.99	3.24	3.24	3.27	3.39	3.68	2.87
1983	3.60	3.50	3.53	3.45	3.41	3.31	3.55	3.61	3.58	3.57	3.43	3.33	3.49
1984	3.09	2.84	2.77	2.75	2.86	2.84	2.86	2.88	2.81	2.79	2.72	2.47	2.81
1985	2.38	2.27	2.50	2.59	2.55	2.50	2.42	2.46	2.56	2.52	2.01	1.67	2.37
1986	1.47	1.46	1.68	1.69	1.61	1.57	1.65	1.74					
CORN No. 2 Yellow, Omaha													
1981	2.51	2.44	2.39	2.37	2.47	2.45	2.48	2.61	2.65	2.65	2.54	2.23	2.48
1982	2.23	2.12	2.35	2.37	2.42	2.62	2.82	3.09	3.10	3.11	3.18	3.39	2.73
1983	3.32	3.23	3.24	3.17	3.11	3.03	3.25	3.33	3.35	3.37	3.22	3.11	3.23
1984	2.94	2.71	2.61	2.55	2.60	2.61	2.68	2.73	2.68	2.70	2.61	2.39	2.65
1985	2.35	2.26	2.28	2.36	2.33	2.31	2.31	2.34	2.43	2.42	2.01	1.61	2.25
1986	1.41	1.40	1.55	1.54	1.44	1.39	1.47	1.57					
SORGHUM No. 2 Yellow, Kansas City													
Dollars per cwt													
1981	4.16	4.14	4.14	4.27	4.44	4.26	4.28	4.45	4.48	4.50	4.38	4.02	4.29
1982	4.06	3.85	4.25	4.37	4.37	4.54	5.08	5.30	5.37	5.37	5.32	5.69	4.80
1983	5.55	5.37	5.25	5.16	5.09	5.03	5.40	5.36	5.39	5.40	4.95	4.74	5.22
1984	4.46	4.25	4.28	4.32	4.48	4.33	4.58	4.76	4.74	4.74	4.50	4.06	4.46
1985	3.56	3.62	3.75	3.97	3.95	3.80	3.82	4.00	4.25	4.00	3.20	2.71	3.72
1986	2.47	2.60	2.70	2.62	2.50	2.57	2.80	2.85					
Year beginning June 1	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Simple average
Dollars per bushel													
OATS No. 2 Heavy, Minneapolis													
1981	2.18	2.02	1.99	2.02	2.09	2.28	2.10	2.23	2.26	2.16	2.21	2.16	2.14
1982	2.12	1.87	1.53	1.51	1.51	1.67	1.67	1.67	1.63	1.63	1.73	1.71	1.69
1983	1.67	1.60	1.79	1.94	2.00	1.97	1.94	1.98	1.82	1.88	1.89	1.96	1.87
1984	1.92	1.84	1.77	1.79	1.84	1.92	1.87	1.81	1.82	1.79	1.73	1.65	1.81
1985	1.59	1.44	1.23	1.24	1.19	1.32	1.39	1.37	1.30	1.27	1.16	1.22	1.31
1986	1.18	1.05	1.12	1.29	1.39	1.72	1.66	1.64	1.56	1.46	1.59		
BARLEY No. 2 or Better Feed, Minneapolis ^{1/}													
1981	2.09	2.26	2.35	2.21	2.26	2.31	2.06	2.20	2.27	2.16	2.16	2.24	2.21
1982	2.12	1.85	1.72	1.69	1.54	1.58	1.59	1.63	1.72	1.73	2.01	1.95	1.76
1983	1.96	1.95	2.42	2.61	2.60	2.53	2.39	2.55	2.56	2.65	2.74	2.77	2.48
1984	2.59	2.18	2.13	2.05	2.10	2.06	1.88	1.98	1.99	1.97	2.05	2.05	2.09
1985	1.90	1.66	1.46	1.40	1.41	1.49	1.60	1.57	—	—	—	1.31	1.53
1986	1.23	1.16	1.13	1.27	1.50	1.63	1.23	—	—	1.64	1.76		
BARLEY No. 3 or Better Malting, 65% or Better Plump, Minneapolis													
1981	3.34	2.95	3.15	3.05	3.02	3.07	2.92	3.00	3.14	2.99	2.98	3.05	3.06
1982	2.93	2.63	2.48	2.37	2.42	2.45	2.37	2.38	2.42	2.45	2.68	2.76	2.53
1983	2.60	2.54	2.76	2.90	2.96	2.95	2.77	2.85	2.76	2.91	3.04	3.06	2.84
1984	3.04	2.86	2.48	2.44	2.43	2.43	2.36	2.46	2.47	2.51	2.52	2.55	2.55
1985	2.46	2.25	2.03	2.15	2.10	2.27	2.29	2.28	2.20	2.34	2.40	2.07	2.24
1986	1.84	1.75	1.61	1.76	1.93	2.02	1.88	1.81	1.92	2.01	2.05		

^{1/} Reporting point changed from Minneapolis #2 feed to Duluth #2 feed beginning March 1987.

Source: Grain and Feed Market News, AMS, USDA.

Table 8.--Feed-price ratios for livestock, poultry, and milk, by months, 1981/82-86/87

Year beginning September 1	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Average
HOG/CORN, U.S. basis 1/													
1981	19.1	18.4	17.7	16.3	17.1	19.8	19.8	20.1	21.8	22.4	23.1	26.6	20.2
1982	28.5	28.2	24.6	23.7	23.4	21.9	18.6	15.9	15.1	14.4	13.9	13.9	20.2
1983	13.3	12.8	11.8	14.0	15.4	14.6	14.3	14.3	14.1	14.6	15.8	16.2	14.3
1984	16.0	16.5	18.4	19.0	18.2	18.4	16.3	15.3	15.4	16.9	17.6	17.4	17.1
1985	17.3	20.4	19.5	19.8	19.0	18.4	17.6	17.3	*	*	29.5	*	19.9
1986 2/	*	37.9	*	*	32.1	*	*	34.0					
BEEF-STEER/CORN, Omaha 3/													
1981	26.0	25.2	25.0	25.0	24.6	25.9	26.5	26.5	27.2	26.5	26.1	29.2	26.1
1982	27.5	27.7	25.1	25.2	24.5	23.4	22.7	21.9	21.8	21.2	19.6	18.1	23.2
1983	17.8	18.4	18.3	19.8	21.6	22.1	21.1	20.4	19.7	19.1	20.4	20.7	20.0
1984	21.3	22.4	24.6	25.6	24.8	24.1	22.2	21.5	21.5	21.0	20.4	21.7	22.6
1985	21.8	25.7	27.8	26.7	25.6	24.4	24.0	22.9	23.0	22.3	28.9	36.7	25.8
1986 2/	42.1	42.7	39.7	38.8	40.8	43.9	41.9	42.2					
MILK/FEED, U.S. basis 4/													
1981	1.48	1.53	1.56	1.54	1.55	1.53	1.53	1.51	1.46	1.47	1.47	1.50	1.51
1982	1.57	1.61	1.62	1.60	1.59	1.56	1.55	1.49	1.45	1.43	1.45	1.41	1.53
1983	1.36	1.39	1.36	1.34	1.33	1.33	1.34	1.32	1.32	1.32	1.35	1.40	1.35
1984	1.48	1.56	1.62	1.59	1.57	1.57	1.55	1.51	1.47	1.45	1.44	1.47	1.52
1985	1.51	1.56	1.55	1.53	1.52	1.50	*	1.48	*	*	1.51	*	1.52
1986 2/	*	1.74	*	*	1.74	*	*	1.62					
EGG/FEED, U.S. basis 5/													
1981	6.4	6.5	7.2	6.7	6.6	6.8	7.1	6.6	5.6	5.3	5.7	5.4	6.3
1982	6.0	6.3	6.3	6.0	5.7	5.8	6.1	5.8	6.0	5.8	5.7	6.1	6.0
1983	6.0	6.2	6.9	7.7	8.8	8.5	7.4	8.6	6.5	5.8	5.8	5.8	7.0
1984	5.9	5.7	6.5	6.3	5.4	5.6	6.3	5.7	5.5	5.9	5.8	6.5	5.9
1985	7.1	7.3	7.5	7.4	7.2	6.9	*	6.4	*	*	6.8	*	7.1
1986 2/	*	7.0	*	*	7.2	*	*	6.7					
BROILER/FEED, U.S. basis 6/													
1981	2.4	2.4	2.4	2.3	2.6	2.6	2.6	2.5	2.6	2.7	2.6	2.5	2.5
1982	2.6	2.5	2.5	2.5	2.6	2.7	2.4	2.3	2.4	2.6	2.8	2.8	2.6
1983	2.7	2.5	2.8	2.9	3.1	3.1	3.1	2.7	2.7	2.7	3.0	2.7	2.8
1984	2.8	2.6	2.8	2.7	2.9	2.9	2.8	2.8	3.1	3.2	3.1	3.1	2.9
1985	3.2	3.1	3.5	3.2	3.2	3.1	*	3.1	*	*	4.5	*	3.4
1986 2/	*	4.6	*	*	3.6	*	*	3.2					
TURKEY/FEED, U.S. basis 7/													
1981	3.1	2.8	3.1	2.9	3.0	3.0	3.0	3.0	3.0	3.2	3.4	3.5	3.1
1982	3.8	3.9	3.9	3.0	2.9	2.9	2.9	2.7	2.9	3.0	2.8	2.8	3.1
1983	3.0	3.0	3.1	3.5	3.6	3.2	3.3	3.3	3.3	3.3	3.6	3.8	3.3
1984	3.9	4.4	5.0	5.5	4.7	3.8	3.7	3.7	3.7	3.8	4.2	4.5	4.2
1985	5.0	5.5	5.5	5.5	3.4	3.5	*	3.5	*	*	4.5	*	4.5
1986 2/	*	4.9	*	*	3.3	*	*	3.5					

1/ Bushels of corn equal in value to 100 pounds of hog, live weight. 2/ Preliminary. 3/ Based on price of choice beef-steers, 900-1,100 pounds. 4/ Pounds of 16 percent mixed dairy feed equal in value to 1 pound whole milk. 5/ Pounds of laying feed equal in value to 1 dozen eggs. 6/ Pounds of broiler grower feed equal in value to 1 pound broiler, live weight. 7/ Pounds of turkey grower feed equal in value to 1 pound turkey, live weight. *—Beginning March 1986 data reporting shifted from monthly to quarterly.

Source: Agricultural Prices, Agricultural Statistics Board, USDA.

Table 9.—Price trends, selected feeds, and corn products

Item	Unit	1986					1987			
		Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
WHOLESALE, MOSTLY BULK 2/										
Soybean meal, 44% solvent, Decatur	\$/ton	163.50	165.20	151.90	154.00	149.60	146.80	154.40	146.60	159.00
Soybean meal, high protein, Decatur	"	178.75	182.40	165.40	167.40	164.30	158.00	169.25	161.20	173.40
Cottonseed meal, 41% solvent, Memphis	"	150.60	152.50	141.90	157.50	160.50	146.25	138.10	128.00	133.80
Linseed meal, 34% solvent, Minneapolis	"	111.25	104.20	114.00	112.50	121.80	106.25	100.00	102.00	118.75
Meat and bone meal, Kansas City	"	178.40	187.10	183.10	189.40	198.50	175.25	173.10	178.60	191.90
Fishmeal, 65% protein, East Coast	"	303.10	320.40	318.00	317.50	315.80	313.30	315.75	—	—
Corn Gluten feed, Illinois pts.	"	88.10	97.80	105.50	109.75	99.20	97.90	98.10	99.60	98.40
Corn Gluten meal, 60% protein, Illinois pts.	"	206.25	208.00	222.50	230.60	241.50	232.20	206.25	208.50	213.10
Brewers' dried grains, Milwaukee	"	61.25	68.70	83.10	101.25	118.00	100.60	61.50	50.50	68.00
Distillers' dried grain, Lawrenceburg	"	—	131.50	129.00	128.60	124.80	113.25	110.10	105.10	100.75
Feather meal, Arkansas Pts.	"	150.30	153.00	155.30	170.60	187.75	145.00	141.25	139.00	138.10
Wheat bran, Kansas City	"	43.40	42.70	36.00	59.25	58.20	57.00	47.00	45.50	36.10
Wheat middlings, Kansas City	"	51.00	55.90	45.40	56.75	63.60	60.25	53.10	44.70	52.40
Rice bran, f.o.b. mills, Arkansas	"	20.40	33.00	27.40	33.10	46.50	45.00	35.00	22.30	26.50
Hominy feed, Illinois pts.	"	74.25	75.00	61.60	65.75	64.40	60.50	58.75	51.50	52.75
Alfalfa meal, dehy., Kansas City	"	81.40	84.20	86.60	90.10	94.50	96.40	95.60	94.60	96.60
Cane molasses, New Orleans	"	76.60	72.30	68.10	60.25	55.50	56.25	59.40	62.00	71.00
Molasses beet pulp, Los Angeles	"	96.00	91.40	90.00	91.90	95.80	103.00	105.00	101.00	94.60
Animal fat, Kansas City	c/lb.	7.9	8.1	8.5	8.7	9.9	11.2	11.5	10.6	9.6
Urea, 42% N., Fort Worth	\$/ton	214	225	225	225	225	225	225	225	225
Corn, No. 2 white, Kansas City	\$/bu.	2.18	1.86	1.90	2.14	2.37	2.50	2.41	2.15	21.0
PRICES PAID, U.S. BASIS 3/										
Soybean meal, 44%	\$/cwt.	"	"	11.50	"	"	11.60	"	"	11.30
Cottonseed meal, 41%	"	"	"	12.10	"	"	12.80	"	"	12.80
Wheat bran	"	"	"	8.89	"	"	8.89	"	"	8.90
Wheat middlings	"	"	"	7.47	"	"	7.81	"	"	7.50
Broiler grower feed	\$/ton	"	"	177	"	"	174	"	"	183
Laying feed	"	"	"	166	"	"	164	"	"	167
Turkey grower feed	"	"	"	215	"	"	210	"	"	209
Chick starter	"	"	"	179	"	"	181	"	"	188
Dairy feed, 16%	"	"	"	153	"	"	153	"	"	152
Beef cattle concentrate, 32-36% protein	\$/cwt.	"	"	11.00	"	"	10.90	"	"	10.50
Hog concentrate, 38-42% protein	"	"	"	13.20	"	"	13.30	"	"	13.20
Stock salt	"	"	"	6.54	"	"	6.56	"	"	6.53
CORN PRODUCTS, WHOLESALE 4/										
Corn meal, New York	"	12.02	11.56	11.60	11.63	11.28	11.15	10.96	11.17	11.35
Yellow	"	9.07	8.56	8.62	8.56	8.26	8.13	7.94	8.15	8.33
Grits (brewers'), Chicago	"	8.16	8.16	8.16	8.16	8.16	8.16	8.16	8.16	8.16
Syrup, Chicago West	c/lb.	22.00	22.00	22.00	22.00	22.00	22.00	22.00	21.75	21.00
Sugar (dextrose), Chicago West	"	13.55	13.55	13.55	13.55	13.55	13.55	12.15	10.38	9.81
High-fructose (dried weight in tank cars), Chicago West	"	13.55	13.55	13.55	13.55	13.55	13.55	12.15	10.38	9.81

1/ Preliminary. 2/ Grain and Feed Market News, AMS, USDA, except urea which is from Feedstuffs, Miller Publishing Co., Minneapolis, Minnesota. 3/ Agricultural Prices, Agricultural Statistics Board, USDA. 4/ Milling and Baking News, Kansas City, Missouri, except starch which is from industry sources. *—Beginning March 1986 data reporting shifted from monthly to quarterly.

Table 10.—Corn, sorghum, barley, and oats exports, 1984/85 to date

Year and month	CORN			SORGHUM GRAIN	Year and month	BARLEY		OATS	
	Grain only	Total process	Grand total			Grain only	Total	Grain only	Total
	Bushels					Bushels			
1984/85					1984/85				
Sept	107,064,816	951,331	108,016,147	26,778,001	June	4,668,354	4,884,210	16,340	204,719
Oct	154,055,992	1,177,835	155,233,827	36,290,021	July	1,506,275	2,146,787	51,644	162,650
Nov	242,124,317	842,579	242,966,896	22,711,771	Aug	4,965,763	5,195,469	28,335	37,065
					Sept	17,185,453	17,474,876	58,861	188,704
1st Qtr	503,245,125	2,971,745	506,216,870	85,779,793	1st Qtr	28,325,845	29,661,342	155,180	593,138
Dec	206,686,724	996,686	207,683,410	25,549,814	Oct	8,750,660	8,959,255	78,898	132,116
Jan	208,081,216	765,323	208,846,539	29,096,442	Nov	9,226,887	9,937,205	25,988	67,587
Feb	165,648,304	1,697,044	167,345,348	32,640,358	Dec	10,739,791	11,773,706	45,452	66,239
2nd Qtr	580,416,244	3,459,053	583,875,297	87,286,614	2nd Qtr	28,717,338	30,670,166	150,338	265,942
Mar	170,693,089	1,208,460	171,901,549	26,135,824	Jan	6,023,494	7,154,739	27,349	56,389
Apr	167,741,483	1,303,826	169,045,309	19,774,404	Feb	4,249,537	4,712,199	44,293	107,702
May	136,292,380	1,659,421	137,951,801	17,817,664	Mar	1,173,727	1,258,040	68,000	75,236
3rd Qtr	474,726,952	4,171,707	478,898,659	63,725,892	3rd Qtr	11,446,758	13,124,978	139,642	239,327
June	105,494,909	2,315,648	107,810,557	25,247,583					
July	95,527,431	1,230,827	96,758,258	18,747,724	Apr	227,362	367,280	35,822	120,640
Aug	90,839,919	986,860	91,826,779	16,117,507	May	2,937,606	3,013,712	13,925	48,363
4th Qtr	291,862,259	4,533,335	296,395,594	60,112,814	4th Qtr	3,164,968	3,380,992	49,747	169,003
TOTAL	1,850,250,580	15,135,840	1,865,386,420	296,905,113	TOTAL	71,654,909	76,837,478	494,907	1,267,410
1985/86					1985/86				
Sept	79,897,274	833,679	80,730,953	29,172,725	June	1,487,412	1,649,817	44,678	87,396
Oct	124,900,086	917,870	125,817,956	23,654,139	July	3,731,241	3,860,606	23,529	69,692
Nov	210,005,197	1,173,603	211,178,800	17,378,277	Aug	5,179,203	5,303,587	33,906	163,983
					Sept	831,326	937,470	52,866	89,470
1st Qtr	414,802,557	2,925,152	417,727,709	70,205,141	1st Qtr	11,229,182	11,751,480	154,979	410,541
Dec	175,971,674	2,540,388	178,512,062	11,858,105	Oct	2,652,026	2,799,218	120,219	153,203
Jan	164,709,634	1,351,663	166,061,297	17,264,657	Nov	3,768,477	3,869,960	111,195	350,174
Feb	119,524,523	1,157,729	120,682,252	13,994,213	Dec	112,702	237,932	23,556	37,750
2nd Qtr	460,205,831	5,049,780	465,255,611	43,116,975	2nd Qtr	6,533,205	6,907,110	254,970	541,127
Mar	97,479,313	922,855	98,402,168	6,723,066	Jan	1,119,603	1,546,100	8,934	69,750
Apr	57,426,414	786,654	58,213,068	8,597,402	Feb	49,160	116,456	43,584	96,515
May	46,520,450	1,254,677	47,775,127	11,610,994	Mar	1,148	192,476	250,397	288,260
3rd Qtr	201,426,177	2,964,186	204,390,363	26,931,462	3rd Qtr	1,169,911	1,855,032	302,915	454,525
June	55,802,755	1,016,137	56,818,892	10,467,071	Apr	720,309	816,587	49,085	93,425
July	44,609,875	871,083	45,480,958	17,830,311	May	57,584	472,599	473,733	693,272
Aug	50,484,684	1,068,258	51,552,942	9,436,885	4th Qtr	777,893	1,289,186	522,818	786,697
4th Qtr	105,897,314	2,955,478	153,852,792	37,734,267	Total	19,710,191	21,802,808	1,235,682	2,192,890
TOTAL	1,227,331,879	13,894,596	1,241,226,475	177,987,845	1986/87				
1986/87					June	2,000	276,815	79,108	128,492
Sept	80,082,655	1,181,307	81,263,962	14,227,263	July	1,164,620	1,597,139	81,504	217,421
Oct	124,025,138	818,619	124,843,757	18,547,828	Aug	12,319,164	12,514,711	73,364	335,437
Nov	114,104,314	848,497	114,952,811	14,680,456	Sept	12,772,707	12,912,177	121,288	327,625
1st Qtr	318,212,107	2,848,423	321,060,530	47,455,547	1st Qtr	26,258,491	27,300,842	355,264	1,008,975
Dec	109,759,488	925,574	110,685,062	19,954,747	Oct	16,480,986	16,559,353	167,403	411,976
Jan	104,283,400	990,714	105,274,114	15,484,239	Nov	14,292,746	14,363,851	32,293	167,870
Feb	98,787,906	657,881	99,445,787	20,749,712	Dec	14,532,134	14,661,828	17,314	315,049
2nd Qtr	312,830,794	2,574,169	315,404,963	56,188,698	2nd Qtr	45,305,866	45,585,032	217,010	894,895
Mar	143,717,211	1,658,289	145,375,500	24,415,530	Jan	1,205,709	1,262,335	30,960	75,145
					Feb	16,084,544	16,522,282	30,776	178,452
					Mar	17,639,725	18,150,611	115,234	277,846
					3rd Qtr	34,929,978	35,935,228	176,970	531,443

Total corn exports include grain only (white, yellow, seed, relief), dry process (cornmeal for relief, as grain, grits), and wet process (corn starch, sugar dextrose, glucose, high fructose). Sorghum includes seed and unmilled. Barley includes grain only (grain for malting purposes, other) and barley malt. Oats include grain and oatmeal (bulk and packaged).

Source: Bureau of the Census, U.S. Department of Commerce.

Table II.—Corn, sorghum, barley, and oats imports, 1984/85 to date

Year and month	CORN		SORGHUM	Total	Year and month	BARLEY		OATS	
	Grain only	Total				Grain only	Total	Grain only	Total
		Bushels					Bushels		
1984/85					1984/85				
Sept	116,290	127,399	0		June	920,819	1,054,291	305,312	322,345
Oct	260,438	317,134	0		July	722,362	883,625	1,469,282	1,490,031
Nov	345,944	440,702	0		Aug	1,023,658	1,165,980	217,495	234,276
1st Qtr	722,672	885,235	0		Sept	284,510	466,491	3,771,243	3,786,897
Dec	41,045	134,862	120,673		1st Qtr	2,951,349	3,570,387	5,763,332	5,833,549
Jan	41,925	147,551	0		Oct	276,438	505,461	3,449,893	3,462,452
Feb	0	81,696	0		Nov	300,744	591,477	1,485,364	1,494,579
2nd Qtr	82,970	354,109	120,673		Dec	1,640,951	1,899,683	4,119,279	4,138,000
Mar	15,777	93,686	0		2nd Qtr	2,218,133	2,996,621	9,054,536	9,095,031
Apr	9,264	38,751	0		Jan	358,752	618,802	4,035,973	4,095,972
May	824,177	936,859	0		Feb	356,654	688,930	4,017,603	4,092,731
3rd Qtr	849,218	1,069,296	0		Mar	537,365	905,566	3,857,568	3,900,423
June	60,875	944,203	0		3rd Qtr	1,252,771	2,213,298	11,911,144	12,089,126
July	1,428	39,177	0		Apr	939,773	1,166,350	5,170,327	5,257,192
Aug	15,836	135,868	0		May	60,460	160,312	1,728,469	1,751,151
4th Qtr	78,139	1,119,248	0		4th Qtr	1,000,233	1,326,662	6,898,796	7,008,343
TOTAL	1,732,999	3,437,888	120,673		TOTAL	7,422,486	10,106,968	33,627,808	34,026,049
1985/86					1985/86				
Sept	8,086	33,974	0		June	340,425	588,237	1,728,933	1,757,614
Oct	314,654	350,199	0		July	251,910	478,428	1,889,404	1,931,401
Nov	540,018	600,046	1,429		Aug	61,653	345,756	825,818	834,833
1st Qtr	862,758	984,219	1,429		Sept	109,312	347,927	1,288,425	1,304,864
Dec	121,966	258,092	0		1st Qtr	763,300	1,760,348	5,732,580	5,828,712
Jan	374,481	483,279	0		Oct	872,324	1,087,159	1,256,991	1,264,610
Feb	456,976	540,101	0		Nov	339,674	591,311	1,672,252	1,678,864
2nd Qtr	953,423	1,281,472	0		Dec	592,242	689,112	3,210,457	3,232,191
Mar	369,991	416,011	0		2nd Qtr	1,804,240	2,367,582	6,139,700	6,175,665
Apr	623,207	662,745	630		Jan	528,661	935,239	3,264,356	3,284,460
May	1,212,047	1,240,983	0		Feb	1,413,559	1,589,598	2,394,906	2,418,051
3rd Qtr	2,205,245	2,319,739	630		Mar	261,745	443,882	2,336,953	2,366,047
June	1,765,143	1,774,942	0		3rd Qtr	2,203,965	2,968,719	7,996,215	8,068,558
July	2,994,897	3,082,335	797		Apr	385,235	616,253	3,574,782	3,591,060
Aug	1,116,694	1,139,076	0		May	1,088,551	1,276,845	3,795,409	3,822,076
4th Qtr	5,876,734	5,996,353	797		4th Qtr	1,473,786	1,893,098	7,370,191	7,413,136
TOTAL	9,898,160	10,581,783	2,856		TOTAL	6,245,291	8,989,747	27,238,686	27,486,071
1986/87					1986/87				
Sept	311,213	332,783	6,329		June	1,296,495	1,501,548	5,325,371	5,345,316
Oct	66,792	107,949	0		July	15,140	223,046	1,841,943	1,868,602
Nov	333,201	353,750	33		Aug	19,469	210,558	1,537,423	1,599,704
1st Qtr	711,206	794,482	6,362		Sept	75,927	307,474	846,095	879,869
Dec	66,353	131,009	0		1st Qtr	1,407,031	2,242,626	9,550,832	9,653,491
Jan	85,979	134,935	0		Oct	31,578	207,980	1,262,426	1,292,827
Feb	14,207	52,622	86		Nov	926,059	1,193,914	2,695,161	3,342,153
2nd Qtr	166,539	318,566	86		Dec	173,536	310,750	1,241,736	1,261,139
Mar	29,812	63,602	0		2nd Qtr	1,131,173	1,712,644	5,199,323	5,896,119
					Jan	392,962	681,307	3,981,067	4,020,146
					Feb	625,953	772,737	3,994,932	4,027,553
					Mar	1,808,103	1,888,079	2,277,619	2,300,061
					3rd Qtr	2,827,018	3,342,123	10,253,618	10,347,760

Corn includes grain only (yellow dent corn, other), seed, and cornmeal. Sorghum is grain only. Barley includes grain only (barley for malting, other), pearl barley, milled and malting. Oats include grain (hulled or unhulled, unhull oats fit and unfit for human consumption, and oatmeal fit for human consumption).

Source: Bureau of the Census, U.S. Department of Commerce.

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LIST OF TABLES

Page Table

		Supply and Disappearance
38	1	Feed grains, Annual, Marketing Year, 1975/76-87/88
39	2	Corn, Quarterly, Marketing Year, 1982/83-87/88
40	3	Sorghum, Quarterly, Marketing Year, 1982/83-87/88
41	4	Barley, Annual, Marketing Year, 1975/76-87/88
41	5	Oats, Annual, Marketing Year, 1975/76-87/88
		Prices
42	6	Average prices received by farmers, United States, by months, 1980/81-87/88
43	7	Cash prices at principal markets, 1980/81-87/88
44	8	Feed price ratios for livestock, poultry, and milk by months, 1980/81-87/88
45	9	Price trends, selected feeds, and corn products
46	10	Exports, corn, sorghum, barley, and oats, monthly, 1984/85 to date
47	11	Imports, corn, sorghum, barley, and oats, monthly, 1984/85 to date

